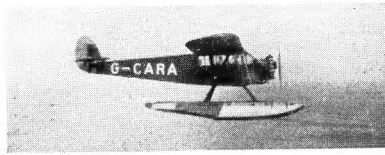


THE 1935
INTERNATIONAL
WILD DUCK CENSUS

P41

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A REPORT ON THE DUCK POPULATION IN ALBERTA,
SASKATCHEWAN, MANITOBA, NORTH DAKOTA, SOUTH
DAKOTA AND MINNESOTA DURING AUGUST, 1935.



MORE GAME BIRDS IN AMERICA

A FOUNDATION

500 FIFTH AVENUE

NEW YORK CITY

FOREWORD

Migratory waterfowl of the North American continent constitute a most valuable international resource which not so many years ago was abundant.

The decline of wild ducks and geese, which has taken place during recent years, can be stopped. Their numbers can be increased substantially within a comparatively short period of time—if and when we treat this natural resource in a sound, business-like manner, such as has been outlined in *More Waterfowl by Assisting Nature*.

A sound, business-like administration of our wildfowl makes it imperative that the annual kill, which is one of the several major causes of decrease, be adjusted to a safe proportion of the available surplus as it may exist from year to year. In no other way will it be possible to handle properly this important factor in the migratory waterfowl supply. Permitting the supply to be reduced to a point where one or more stop-gap closed seasons were resorted to would prove far more detrimental to the birds than the logical course outlined above.

It is imperative that the annual duck crop and the total number of ducks be ascertained before regulations governing the yearly take are made. This work never before has been undertaken on the scale or in the manner described herein. The necessity for it and the practicability of the task have been outlined in *The Duck Decline in the Northwest*, published in 1933.

This year the Foundation has undertaken the work of conducting a duck census in an extensive area, limited by the means it had available for the task. Its sole purpose was to find the facts in the only places where fact-finding of this nature is practicable—on the breeding grounds.

NOVEMBER, 1935.

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ACKNOWLEDGMENT

We gratefully acknowledge the splendid cooperation of thousands of individuals and organizations who have taken an active part in rendering voluntary services in this work.

In particular are we indebted to the Department of the Interior, National Parks of Canada, the United States Bureau of Biological Survey, and the United States Forest Service for their encouragement; to the game departments of Alberta, Saskatchewan, Manitoba, North Dakota, South Dakota, and Minnesota for their active participation; to Canadian Rural Municipalities, to United States County Agricultural Agents, to numerous organizations and individuals who have conducted and done field work; and to newspapers and periodicals in many localities which created and fostered interest on the part of their readers. A list of individuals who have taken a conspicuous part in this work is appended.

Without the whole-hearted cooperation of these, the work would not have been possible.

MORE GAME BIRDS IN AMERICA

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I

SUMMARY OF DUCK POPULATIONS

In the entire census area there were at least 42,700,000 ducks during August, 1935, distributed as follows—

1. Alberta—Southern section	1,600,000
2. Saskatchewan—Southern section	2,400,000
3. Manitoba—Southern section	1,400,000
4. Alberta-Saskatchewan, Central Lake Area.....	10,900,000
5. Saskatchewan, between Central Lake Area and edge of the Canadian Shield	1,800,000
6. Manitoba-Saskatchewan, The Pas Area.....	3,500,000
7. Manitoba, Winnipegosis-Winnipeg Lakes Area.....	2,200,000
8. Alberta—Northern section (north of 53rd parallel and Central Lake Area, exclusive of 9 and 10).....	5,500,000
9. Alberta—Lake Claire Area	900,000
10. Alberta-MacKenzie, Slave River Area.....	7,300,000
11. The Canadian Shield in Saskatchewan and all areas in Manitoba, exclusive of 3, 6 and 7.....	3,000,000
Total	40,500,000
North Dakota, South Dakota, and Minnesota.....	2,200,000
Grand Total	42,700,000

Totals by provinces:

Alberta	16,400,000	
Saskatchewan	12,000,000	
Manitoba	7,500,000	
Portion of MacKenzie District..	4,600,000	40,500,000

Totals by states:

North Dakota	1,200,000		
South Dakota	350,000		
Minnesota	650,000	2,200,000	42,700,000

All of the above areas are outlined on Map 1.

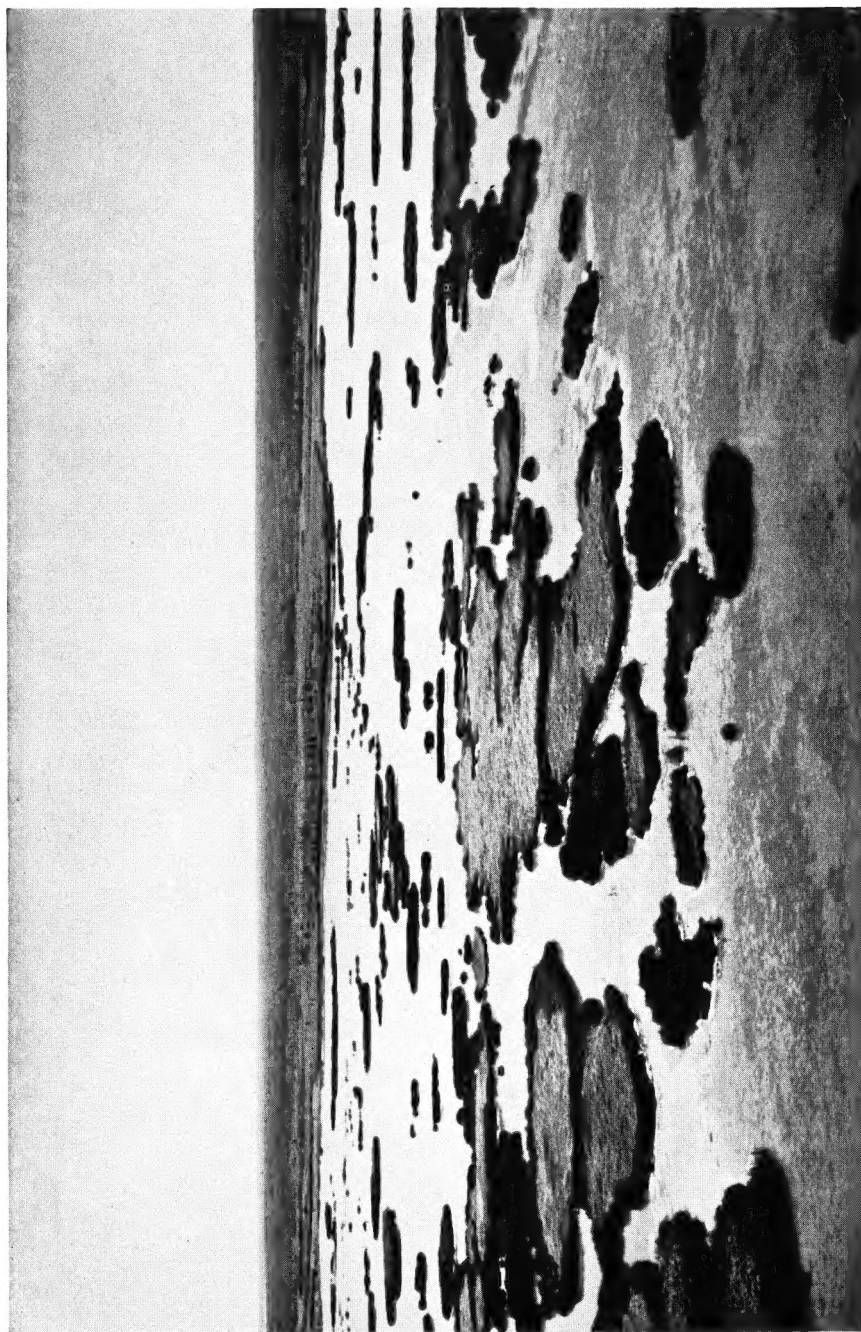


FIG. 1 (Map 2)—Turtle Lake, Saskatchewan, one of the Numerous Duck Breeding Waters Located in Timbered Country: A small portion of the northern end of the lake, dotted with rush-fringed small islands which provide ideal nesting sites.

II

SCOPE AND PROCEDURE OF THE CENSUS WORK

The decision to take the duck census was made about the middle of July, 1935, without any prior preparation. The breeding season was well advanced at that time, some of the early nesting ducks having already reared young to an age at which they were able to take care of themselves independently.

Lack of time did not permit coverage of all of the vast northern duck breeding range extending from the Atlantic to the Pacific. It was quite apparent that the census work would have to be confined to a smaller portion of the area. Hence, it was decided to limit the investigation to the major part of the most productive region: The Provinces of Alberta, Saskatchewan, and Manitoba, and the States of North Dakota, South Dakota, and Minnesota.

The area which came under investigation is about twelve hundred miles long from north to south and of an equal width from east to west at its widest part. It embraces 762,497 square miles in Canada and 233,134 square miles in the United States, a total of 995,631.

The southern portion of this area is largely settled and developed, and forms part of the agricultural belt. Wheat is the principal crop; rye, barley, oats, corn, and flax are also produced; and a considerable acreage is used for



FIG. 2 (Map 4)—The Farm and Woodlot Country: The village of Waskatenau, 50 miles northeast of Edmonton, Alberta.

grazing. Wood lots and timbered tracts are uncommon in this level or gently rolling prairie country, except in limited sections. They are extensive along the northern rim and in parts of Minnesota.

To the north of the agricultural area the country is overgrown with timber and underbrush of spruce, jackpine, tamarack, poplar, birch, alder, willow, and a variety of fruit-bearing shrubs, such as blueberries, raspberries, dwarf juniper, cranberries, snowberries, gooseberries, wintergreen, and wild rose. Much of it is taken up by muskegs (mossy bogs generally overgrown by brush and trees).

Myriads of lakes and ponds occupy a very large part of this northern area, particularly in Saskatchewan and Manitoba. Innumerable lakes, sloughs, and potholes also dot the agricultural areas, chiefly in Minnesota and parts of South Dakota, North Dakota, and the three provinces. These still waters, occasional marshes, and the streams were the chief objectives of the investigation since they held all the clues to duck populations and breeding conditions.

In the agricultural belt most of the waters are in localities accessible by automobile. Roads peter out, however, at the northern limit of the settled area. The most northern points that may be reached in the prairie provinces by overland transportation are Waterways and Peace River in Alberta, Meadow Lake and Big River in Saskatchewan, and Sherridon and Churchill in Manitoba. These are tapped by long extensions of the railroad system from the agricultural belt. Most of these extensions reach out far beyond the highways.

The census work was done in the most thorough manner possible within

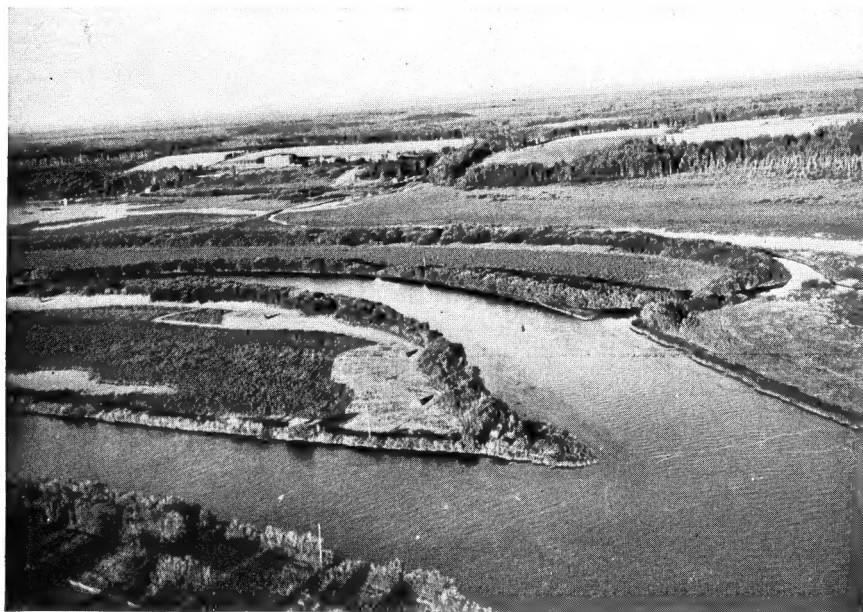


FIG. 3 (Map 1)—A Clearing in the Timber Country of West Central Saskatchewan: Beauval Settlement on the Beaver River.



FIG. 4 (Map 4) — Central Saskatchewan Panorama: Mixed timber and clearings near Stump Lake.

the brief period of time available. For its accomplishment in such a large area, the active participation of thousands of cooperators in the agricultural belt was secured and the northern area was surveyed by means of airplanes. Thus, the task consisted of two major phases:

1. Investigation of the settled area by numerous local cooperators on the ground.
2. Examination of the northern area from the air.

The work on the ground was conducted with states and provinces as major units. Upon telegraphic inquiry, all of the state and provincial game authorities wired their approval of the census work and promised whole-hearted cooperation. The sportsmen's leagues of the three Canadian provinces also telegraphed acceptances of the plan and offered assistance. All that was needed was proper leadership in each state and province. This was entrusted to one employee in each of the three states, and to members of the Foundation's staff in the provinces.

To the greatest extent possible, the objective was to obtain a simultaneous and complete coverage of the agricultural area by volunteer cooperators on the ground. That required immediate and adequate organization in enlisting volunteers and arranging for the distribution and collection of thousands of printed instruction sheets and questionnaires.*

* Several questionnaire forms returned by co-operators are reproduced on Sheets A and B.



FIG. 5 (Map 5)—The Northern Alberta Wilderness: Dense conifers along the Peace River, Wood Buffalo Park.

With the exception of minor changes, the questionnaires were uniform. They provided for the gathering of the following information:

1. Counts of ducks, by species wherever ascertainable.
2. Counts and sizes of broods, by species if possible.
3. An estimate of ducks present in addition to those actually counted.
4. The main causes of losses of ducks and nests.
5. Information on duck breeding places which might be improved or restored by building dams and dykes.
6. Recommendations for improving duck breeding conditions.
7. Exact location of area investigated, and name, occupation, and address of investigator.

The key men began work in their respective states or provinces the last week in July. About one week was allowed for organization work and distribution of the blanks. The ground work began during the first few days in August and terminated August 17.

The work with airplanes in the northern areas was done by members of the Foundation's staff during the second half of August. Local observers in each province participated in some of the flights. The flights extended beyond the northern border of Alberta to Great Slave lake, Northwest Territories.

The plan and the methods applied proved very satisfactory. A wealth of information on this most important duck breeding area on the continent has been gathered. Much of it is published in this report.

III

THE WORK ON THE GROUND

In each of the three states (Minnesota, North Dakota, and South Dakota) in which the census was made, the work was done along similar lines. A picture of operations may be gained from the following brief description of the work in Minnesota, which is typical of all three states—

Wallace Grange *, of Sturgeon Bay, Wisconsin, was in charge. His activities began in St. Paul with the cooperation of Conservation Commissioner E. V. Willard, Director Erling Swenson and Biologist Gustave Swanson of the Fish and Game Department.

Adequate coverage of the state required a plan for subdivisions through which the work could be handled effectively and expeditiously. This was done by counties as units with a committee in charge of each. Each county committee had its chairman and a varying number of advisory members who made arrangements for the field work. Instructions were issued 140 game wardens to cooperate with local county committees and to serve as ex-officio members.

The program was outlined and a list was prepared of individuals qualified to serve as county chairmen and cooperators. In this work the following were most helpful: Minnesota Game Protective League, Charles W. Henke, Secretary, Minneapolis; Midwest Conservation Alliance, Cyril Plattes, President, St. Paul; Minnesota Izaak Walton League, Paul Struck, State Secretary, Paul Clement, Secretary, Dr. Bagley, President; and many others.

Cooperation of the Civilian Conservation Corps was obtained through Major Charles Barnwell of Fort Snelling. Chief Forester F. A. Silcox issued instructions from Washington to United States Forest Service officials in the state to assist. Minneapolis and St. Paul newspapers gave excellent publicity cooperation, and radio time was made available to announce the purpose of the census and to solicit aid.

With a comprehensive list of prospective county chairmen and cooperators compiled, announcements of the proposed waterfowl census appearing in the press, and full cooperation of the state game warden force assured, telegrams inviting cooperation were sent individuals in all counties.

Headquarters of the Minnesota census were then established at Bemidji, census forms prepared for distribution, and soon acceptances of the telegraphic invitations were received. A total of 75 of 87 Minnesota counties were or-

* Mr. Grange was formerly with the United States Bureau of Biological Survey, is now operating a game farm, and is a practical game management specialist. His experience with Herbert L. Stoddard in the Co-operative Quail Investigation, was particularly valuable in conducting the Minnesota census work.

ganized with chairmen or game wardens in charge. Where chairmanships could not be filled promptly, the local game warden was requested to assume responsibility.

The work of one unit, Itasca County, may be cited as an example of county procedure. George Baker, of Bemidji, was Chairman, assisted by Wesley Libbey, of Grand Rapids. They were ably assisted by game wardens Walter Hensel, of Deer River, and H. B. Kuluvar, of Grand Rapids. Local cooperators were enlisted by personal contact and by mailing form letters to likely prospects. The work was given ample publicity in the newspapers. In a few days, tally sheets were placed in the hands of a number of cooperators of which 23 filed 69 returns on the results of their field investigations. They included United States and Minnesota Forest Service foremen and patrolmen, farmers, resort keepers, sportsmen, guides, trappers, etc.

These tally sheets were used in the field for recording observations pertaining to small units, such as ponds, springs or portions of a lake. The information gathered in the field was transmitted to the county chairman, who tabulated it on summary sheets covering larger areas, such as a township, large lake or portion of a stream. Once the county committee completed its work, it sent the summary and tally sheets to headquarters at Bemidji.

In some cases county committees assumed responsibility for conducting the work in portions of adjoining counties. In one instance, three counties, Stearns, Sherburne, and Benton, were included in a unit which was handled by the T. S. Roberts Ornithology Club of St. Cloud, Jack Hanson serving as unit Chairman. George Friedrich, member of the Game and Fish Commission and head of the club, arranged to have one full-time volunteer worker in the field. His transportation was provided by Game Warden B. M. Weber.

Problems that cropped up were dealt with speedily at headquarters. Some county chairmen reported difficulty in carrying out the census work in certain localities owing to extremely rank vegetation. In such cases, arrangements were made for obtaining partial brood counts and for field work early in the morning or late afternoon, when most of the birds present appeared on open portions of waters. In wooded sections studded with innumerable lakes and ponds sampling methods were resorted to and the findings rechecked. In areas containing many beaver flowages, endeavors were made to obtain an accurate estimate on the number of the latter and the duck population on some of them also was ascertained. A number of widely-distributed areas were independently investigated from headquarters for checking purposes.

Apparently only those who had an interest in wildlife volunteered for this service. The work was by no means easy. It took time from other activities. The wheat harvest was in full swing and this was the busy season in Minnesota generally, yet cooperation was excellent. Hundreds of actual counts and tallies were made by field investigators. The main breeding areas of Minnesota were certainly well taken care of.



FIG. 6 (Map 1)—A Typical Duck Breeding Area in the Prairie Lake Country of Northeastern South Dakota: Ducks on Red Iron Lake photographed by a census taker.

The work in the Dakotas was carried out in a similar manner with slight variations in the organization work, which was adapted to local conditions. In South Dakota, C. R. Young*, of Rapid City, was in charge of the census. Director of the Game and Fish Commission, O. H. Johnson rendered valuable assistance in organizing the State and instructing his warden force of twenty-seven men to take an active part. The Agricultural Extension Service took the leadership in developing the program further. This was made possible through the interest and helpfulness of County Agent Leader Ross D. Davies and State Club Leader H. M. Jones.

County Agents were detailed to form committees for coverage of their respective counties. 4-H Clubs and volunteer local organizations and individuals carried out the field work. Headquarters for the census were at the State College of Agriculture, Brookings.

In North Dakota, too, the key man, R. S. Livergood**, of Wilton, was a resident of the State. Game Commissioner A. I. Peterson made his wardens available for the work and provided office facilities. Deputy Commissioner A. H. Erickson relieved Mr. Livergood to the extent of personally assuming complete supervision of the southwestern portion of the state situated south and west of the Missouri River. Sportsmen's organizations of the state provided excellent cooperation. Organization work was carried on chiefly by contacting individuals and officials of associations in every county.

In the Provinces: Canadian game departments, government officials, and game leagues took the leading part in organizing the work in the Provinces.

* Mr. Young is a graduate of Game Conservation Institute, Clinton, New Jersey, and has had extensive experience in the production of game birds, particularly at the State Game Farm at Yaphank, Long Island, N. Y.

** Mr. Livergood has had 30 years experience in conservation activities in his county and state.

The following brief description of the procedure in Saskatchewan is typical—

After consultation with Provincial officials and representatives, officers of the Saskatchewan Fish and Game League and other interested individuals, Game Commissioner A. E. Etter addressed a letter to the Secretary and Treasurer of each of the three hundred and four organized rural municipalities, asking their cooperation in gathering the necessary information. A supply of instruction and tally sheets for the use of local observers was enclosed with each letter.

Each organized rural municipality consists of an average of nine townships and the secretary-treasurer of the municipality was asked to have one or more responsible citizens in each township undertake the field work and make the returns to him. These returns were numbered and tabulated by the offi-



FIG. 7 (Map 4)—A Typical Lake of the Central Alberta-Saskatchewan Timber Country: Beaver Lake, source of Beaver River.

cials on summary sheets supplied for that purpose. The field investigators were also furnished with blank township plats on which they were asked to mark the location of areas investigated. These plats proved very valuable in checking and interpreting the field work*.

Headquarters of the Fish and Game League contacted simultaneously all of their thirty-eight branches informing them in detail of the plan outlined and requesting them to obtain as complete returns from the rural municipalities as possible. They were asked also to lend their assistance to the officials of the municipalities and to make independent returns on limited areas through their members for checking purposes.

All of this work was conducted under the auspices of a committee for the province, consisting of representative officials and individuals intensely in-

* A group of plats returned by co-operators and a report of a municipal secretary are shown on Sheets A and B.

terested in the plan. Within forty-eight hours after first presenting the program to them, the plan for the province was outlined, organization work completed, blanks and letters prepared, printed and mailed. The secretary-treasurers forwarded the completed returns to headquarters of the Fish and Game League which kept a tab on the progress of the work.

Among those who were most helpful in furthering the work were: Dr. W. W. Amos, Deputy Minister Natural Resources Department, Regina; Hon. R. J. M. Parker, Minister of Municipal Affairs; W. G. Ross, K. C., M. L. A., Moose Jaw; A. E. Etter, former game commissioner and his successor, J. R. Hill, Regina; Art Donner, Canadian Industries Limited, Saskatoon; J. J. McGurran, Secretary of the Saskatchewan Association of Rural Municipalities; the following officers of the Saskatchewan Fish and Game League: F. T. Clarke, W. Macguire, C. H. Niles, W. M. Van Valkenburg, Cliff Jones, K. W. Ross;



FIG. 8 (Map 1)—Dense Reed Grass (*phragmites*) and Bulrush (*scirpus*) Explored by Observers: The Delta Marshes at the southern end of Lake Manitoba.

and many others. Radio talks by several members of the Fish and Game League and valuable cooperation by newspapers greatly stimulated public interest and cooperation.

In Manitoba, the work was organized similarly through the whole-hearted cooperation of Hon. J. S. McDiarmid, Minister, and C. H. Atwood, Deputy Minister, Department of Mines and Natural Resources; Hon. W. J. Major, Attorney General; A. G. Cunningham, Director of Game and Fisheries; the Manitoba Game and Fish Assn., E. B. Pitblado, President, E. H. Hebb, Jr., Secretary; Dr. H. J. Merkeley, Chairman, Manitoba Game Commission; Col.

H. I. Stevenson, Provincial Forester; Natural History Society of Manitoba, A. G. Lawrence, President; Manitoba Division Canadian Bankers Association represented by Mr. C. L. Broley; and many others.

A committee for the province was formed of provincial officials, representatives of the Manitoba Division of the Canadian Bankers Association, the Natural History Society of Manitoba, and the Manitoba Fish and Game Association which took the leadership. Here, too, rural municipalities constituted the units in the province through which blanks were distributed and information was gathered. The committee contacted all of the county court clerks and branch bank managers and asked for cooperation and assistance.

In Alberta the work was organized with the cooperation of the Deputy Minister of Agriculture J. F. Andrew, Deputy Minister of Municipalities E. L. Gray, Chief Game Guardian Stanley F. Clark, Provincial Director of Fisheries and Chief Migratory Bird Officer R. L. Rodd, Director of Forestry T. F. Blefgen, Colin Groff; The Alberta Fish and Game Association, H. Wyman, President, L. E. Wize, Vice-President, George M. Spargo, Secretary, and the officers and members of twenty-six local fish and game associations. In addition, municipal district secretary-treasurers, forest rangers, fish inspectors, and local fish and game associations, and numerous individuals were contacted.

People of all walks of life took an active part in this work. They gave freely of their time and travelled at their own expense for the mere satisfaction of rendering services for the good of the cause, irrespective of personal beliefs or organization platforms. The enthusiasm with which the plan was received and carried out was impressive. Most of the volunteers appreciated the need for the investigation and were eager to do a good fact-finding job in their own localities. The information they gathered has proved most valuable and interesting.

IV

SURVEYS FROM AIRPLANES

The timbered country north of the agricultural belt is inhabited by a very few people, at scattered trading posts, fire ranger stations, missions, Indian villages or agencies, and trappers' cabins. The only means of travel in this country are the canoe during temperate seasons; dog teams in winter; and airplanes at all times of the year.

The people of the north country are air-minded to a surprisingly high degree. Airplanes are commonly used for travel by prospectors, trappers, traders, government officials, and by all who can afford this mode of transportation. Food supplies, furs, and other articles of trade, fish for shipment to the markets, and even dog teams are carried by plane. A number of commercial



FIG. 9 (Map 1)—An Evening Rendezvous at Ile à la Crosse, Saskatchewan: Two of the planes chartered for aerial observations.

airlines with headquarters at Winnipeg, Prince Albert, Edmonton, and Fort McMurray, maintain regular weekly schedules to various points as far north as Aklavik in the MacKenzie River delta.

On their regular trips these planes fly at altitudes too high to permit close observations of duck breeding grounds and bird life. Used exclusively for the latter purpose, however, the airplane affords excellent opportunities for the study in detail of hundreds of square miles in hours as against weeks and months of arduous effort on the ground. There are relatively no problems in moving from place to place rapidly, or in observing bird populations, whether they be on the surface of the water, in rushes and reeds, or on shores. From



FIG. 10 (Map 4)—Shore Line Details are Easily Discernible from the Air: The rushy and wooded shore of Baptiste Lake, Alberta.

the air, numbers can be accurately ascertained—it is even possible to count lily pads floating on the water. On the areas investigated from airplanes, marsh plants along the shores and in the water, such as bulrushes and cat-tails, rarely grow thick enough to hide ducks from view from above.

The primary purpose of the survey from the air was to ascertain populations of wild ducks by numbers, and, wherever possible, by species. In addition, records were kept of the general nature of the countryside traversed and of the character of waters, marshes, and streams along the route. Notes were made of the extent to which the waters were surrounded by cultivated fields, grazing lands and other clearings; timber or brush (standing or burnt); the appearance of shorelines, whether overgrown or separated from timber or brush by bare strips; whether the shores were level or abrupt, muddy, sandy, gravelly or rocky; and the extent and kinds of marsh plants growing along the shores and in the water. Attention was also paid to the probable depth of lakes. Those, for instance, which had a clear blue or green color indicating



FIG. 11—Streaking Away from the Approaching Plane: 100 ducks on an acre of water appear like this to the small camera. It is much easier to see the birds while flying than it is to photograph them.

greater depth were distinguished from the yellowish or brownish colored shallower lakes, which usually support aquatic plant growth. Records were kept of altitudes at which photographs and moving pictures were taken and also of light and weather conditions bearing on the degree of visibility. Small hand cameras were used in taking pictures. Approximately 1000 scenes were snapped from the air, a few of which are reproduced in this publication.

There was little difficulty in ascertaining the number of ducks on water areas examined. In the course of several preliminary test flights, all observers acquired clear mental pictures of groups of ducks consisting of 25, 50, and 100 birds approximately. The latter proved convenient units for estimating accurately flocks of up to 500 birds in various environments, such as on the surface of water, along shores, and in the air. In calculating the number in larger flocks which upon approach would take wing, it was found advisable to observe them at some distance and to apply census units of 500 or 1000 birds.

Larger bodies of water that were wholly or partly sprinkled with ducks were appraised by the approximate number of birds per acre and square mile, after a thorough combing of the area to ascertain the unit of density. This was the case most frequently on areas populated chiefly by diving ducks. Where an area was too large to be thoroughly combed, a representative sample area consisting of several townships (36 square miles each) was chosen and covered in detail from border to border in parallel lanes about one mile apart. Township and section lines shown on the maps served as guidance in appraising the length of distances flown and the size of any particular area.

During the preliminary test flights, observers alternated so that all gained a uniform conception of the units and methods chosen for ascertaining duck populations. These test flights proved very useful also to the pilots, who soon became intensely interested in the work. They readily learned to distinguish at a great distance good breeding areas from unattractive ones, to approach the lee side of the waters first from the direction of the sun, and to follow signals from the observers understandingly. Thus, it soon became possible to make observations and take pictures under optimum conditions.

Close observations were usually made at altitudes of less than 200 feet, at which visibility with the naked eye was excellent. At higher altitudes field glasses may be used, but considerable experience is required to train the glasses quickly enough on small objects before they pass from view. Flights at low altitudes and the making of observations without the aid of field glasses proved more practical and were uniformly resorted to.



FIG. 12—Each Dot a Duck: 100 birds on a half-acre section of shore line, photographed from an altitude of about 150 feet.

It was easy to distinguish surface-feeding ducks, by the way they took to the air, from diving ducks which preferred to move away from the plane by swimming at top speed or by diving. On the whole, the species most readily distinguishable were the scaups, white-winged scoters, buffleheads, and golden-eyes. At times prominent colorations of the birds were clearly visible. At other times, due to light conditions,

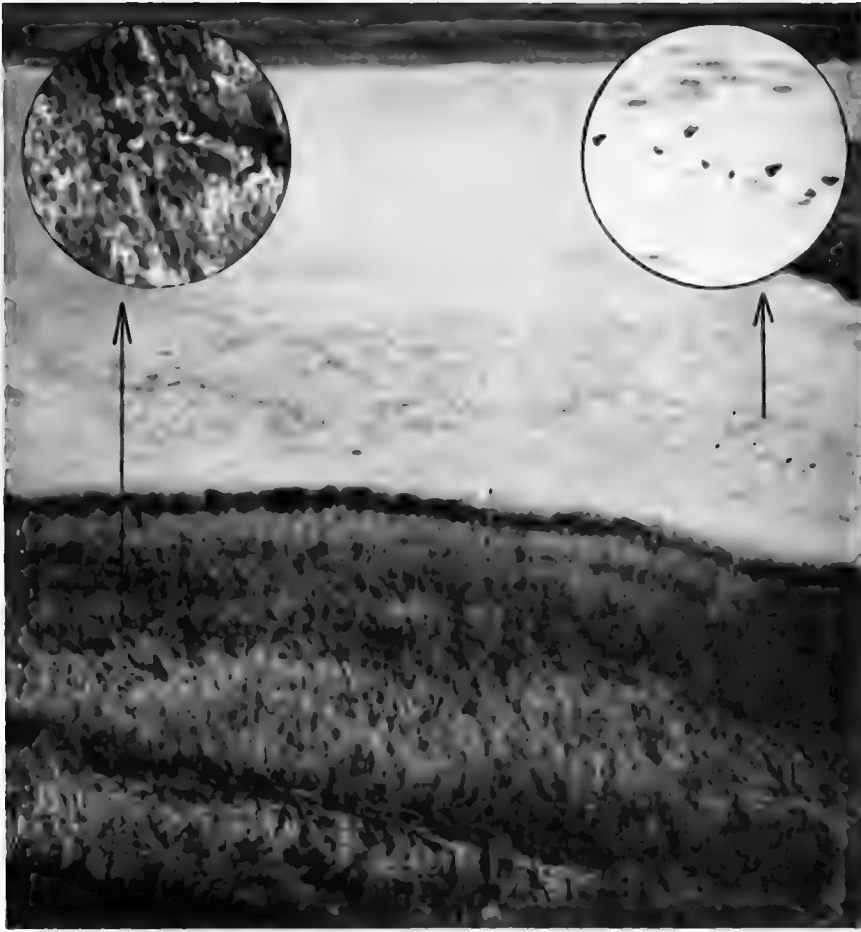


FIG. 13—Light Conditions Distort Plumage Colorations to Both the Eye and Camera Lens:
The dark plumage of the rising mallards in the above registers correctly.
In Figures 14 and 53 the same species appear entirely white.

all birds appeared uniformly colored—often of either a dark or a very light shade—both to the eye and on photographs. Wherever positive identifications were made, the facts were noted. On densely populated areas particular attention was paid to eliminating errors that may have cropped up through the presence of coots or grebes in appreciable numbers. This was especially necessary on areas inhabited chiefly by young birds.

At first, early morning and late afternoon hours were given preference for survey work. Later, however, it was found that the birds frequented open waters during all daylight hours, and since the early and late hours impeded photographic work, the practice was discontinued. The weather frequently changed during the course of observation flights, lessening visibility and at times seriously handicapping the work. Hence, notes on the weather and visi-

bility were made to mark the thoroughness of the work in each area investigated along the route.

The finding of the most important breeding grounds was of first consideration and relatively less attention was paid to areas which appeared to be thinly populated. All available topographic and soil maps were studied in detail for geographical and geological features. Then several exploratory flights were undertaken in order to study the general character of various areas. By a process of elimination, it was then possible to discern, and to concentrate on, those areas which appeared to be most productive.

The network of routes to be flown was laid out so as to permit an adequate combing of the area under investigation and to provide for meetings of the planes once or twice each day at pre-arranged points. The latter appeared to be a desirable precaution against loss of contact in cases of emergency, such as forced landings in uninhabited sections.

The routes flown are shown on Map I. The total air mileage of all routes came to approximately 15,000. Seven different airplanes were chartered for the observation work but most of the flying was done with a Fairchild (1929 rebuilt, Wright "J5" engine) and a Stinson (1933, Lycoming engine).

In the survey work from the air, the maps issued by the Dominion Department of the interior, Topographical Survey, proved exceedingly helpful. These maps are drawn to a scale of either three or four miles to the inch. Many of them are of recent issue and accurately show lakes, streams, topographic features, prominent landmarks, etc. The course charted was marked on a duplicate set of these maps, one set for the use of the pilot and the other for the observers. Pilots and observers studied the maps prior to each day's flights.

Most of the survey work from the air in Manitoba was done between August 12 and August 19. By August 20 the work on the ground and exploration and training flights were completed. Then all four members of the Foundation's staff concentrated exclusively on surveys from the air.* In two pontoon-equipped planes, chartered solely for use in the census work, they left Prince Albert to follow the routes mapped out in Saskatchewan, Alberta, and Northwest Territories. Each plane carried a pilot and two observers. Observations of importance were jotted down in note books or directly on the maps. Pictures taken were similarly recorded for later identification.

On "dry hops," that is, over land between water areas, the pilots kept

* The following also participated in survey work from the air along various portions of the routes in planes chartered for the purpose—In Manitoba: William Vogt, unofficial observer for the National Association of Audubon Societies, New York, and Ed. B. Pitblado, President Manitoba Game and Fish Assn., Winnipeg. In Saskatchewan: Frank T. Clarke, Vice-President Saskatchewan Fish and Game League, Regina, Reuben Lloyd, official observer for the Province of Davidson, and Major Richard Loney, Saskatchewan Fish and Game League, Moose Jaw. In Alberta: Dr. H. W. Lewis, Chipe-wyan. In addition, former Game Commissioner of Saskatchewan A. E. Etter made a report on the result of his observations in conjunction with this work gathered on a flight from Prince Albert to Cree Lake in a plane not chartered for census purposes exclusively.

to altitudes of from 800 to 4000 feet, depending on distances between waters. In approaching water areas along the course, the pilots descended to an altitude of about 500 feet. If from that altitude it appeared worthwhile, a further descent to 200 feet or lower followed for a close combing of the area. Landings often appeared very desirable for a study in detail of particular localities. Such landings, however, were not frequently made, for most of the waters were unknown to the pilots, who were loath to risk the smashing of pontoons on hidden rocks or floating timber, or to take chances with difficulties in taking off again, such as rough water or still air.

* * *

You may now join one of the observation crews for a few hours of a typical day's work. You are at the small resort of Meota on Jackfish Lake, Saskatchewan (Map 2). It is 5 A. M. and Bob Webb, local manager of the Imperial Oil Company, is prompt in keeping his appointment to pick up with his light truck observers and pilot for a trip to Murray Lake. This area, flown over in the dusk of the preceding evening, appeared to be a very rich breeding place which merited investigation from the ground.

After a short truck ride, we arrive at the Murray Lake marshes and soon start exploring its channels and openings by canoe. Mallards, blue-winged teals, pintails, shovelers, and other puddle ducks rise singly and in groups all about us. Coots scamper to cover. The marsh has a rich muck bottom resting on clay and supporting an exceedingly rich aquatic and marsh vegetation. Widgeon grass, soft-stemmed bulrush, and three-square, all laden with seeds, predominate. On a short muddy portage we come to the remains of a freshly killed duck. Tracks of a multitude of birds have obliterated clues to the identity of the killer.

A few minutes later muskrats frantically scamper through the reeds pursued by a fine specimen of a weasel which crosses the bow of our canoe with remarkable speed. On a somewhat elevated place, we gain a view of an open stretch of water of about five acres bordered by heavy growths of rushes. Some 225 ducks and 75 coots and grebes are visible on this area—too few to reflect the multitude which appeared to be general on the marsh the evening before. But soon the riddle is solved—a few shots on a somewhat distant field adjoining the marsh send a cloud of mallards skyward. About 2,500 of them were raiding a grain field and the farmer was taking steps to frighten them off. A brief survey reveals that 50% of the duck population on the lake consists of mallards, 15% of blue-winged teal, 10% pintail and the remaining 25% of shovelers and a few species of diving ducks.

Upon returning to the plane, an hour is consumed in an endeavor to take off in the still air on the surface of Jackfish Lake. Finally the feat is accomplished and soon we circle over the marsh, a small portion of which we had investigated on the ground. Again the ducks rise on all sides and, after considerable circling, the population is estimated at an average of 7 ducks per acre. Several pictures are taken. We note that most of Murray Lake is



FIG. 14 (Map 2) —Murray Lake is Really a Great Marsh: Note the rising ducks and those on the water.

marshy, heavily overgrown with bulrush and some cat-tail, and that there is considerable open water. (See Fig 14.) As we proceed over its northern portion, the shoreline becomes sandy or stony, the marsh peters out to a fringe of bulrushes growing along sections of the shore and the duck population diminishes rapidly.

At the northern end of Jackfish Lake, another marsh area of about 1,500 acres shows a similar density of duck population. But here it consists chiefly of canvasbacks, redheads, and a scattering of surface-feeding ducks.

The route now follows Jackfish Creek into fairly open country of sandy character, in which most of the water areas have dried up. The pilot is striving for altitude, for there is a long "dry hop" to Birch Lake ahead, interrupted by an inconspicuous group of waters of which Russell Lake is the most prominent. First comes an unnamed lake west southwest of Russell Lake which is bare of ducks. Russell Lake itself has a stony and sandy beach, partly bordered by timber. It appears to be a poor duck breeding area, excepting its northwestern marshy arm on which 150 surface-feeding ducks are visible. The water in the unnamed lake west northwest of Russell Lake is of greenish color, there are no marsh plants, and the beach is stony or sandy and bordered by woods. About 50 ducks are visible on the water.

Proceeding toward Birch Lake the country becomes wooded. Macleod Lake shows stony shores. Brush and tree growths stop about 100 yards from the shoreline. We are flying too high to observe bird life but lack of time does not permit us to descend closer.

As we reach the southern point of Birch Lake, the pilot dives the plane to an altitude of 300 feet. This is a large and deep water crowded in by timber for the most part. There are some wooded islands. At first we see



FIG. 15 (Map 2)—Birch Lake, Eastern Shore: Timbered, stony and fringed with bulrushes. The river-like arm of the lake in the distance is shown on the map.



FIG. 16 (Map 2)—Helene Lake, Eastern Shore: Wooded, stony and rush-fringed.
Numerous canvasbacks, redheads and scaups dot its waters.

rushes containing about 200 diving ducks. The rushes persist along a narrow strip of the eastern and northern shores and in numerous arms and bays (Fig 15) that contain a scattered duck population averaging 5 birds per acre. Most of the rest of the lake has stony shorelines and is devoid of ducks. The total water area of Birch Lake is somewhat in excess of 13,000 acres, of which about 2,000 acres in rushes contain at least 10,000 ducks.

Helene Lake, which almost touches Birch Lake, brings a surprise. It is teeming with diving ducks—mostly adult canvasbacks, redheads, and scaups,



FIG. 17 (Map 2)—Helene Lake, Southwest Portion: Showing the extensive bulrush beds in this shallower part of the lake.

the canvasbacks predominating. After following the eastern shoreline (Fig. 16), along which the birds are most plentiful, we land at the northern portion of the lake for closer observation. The large birds are popping up and ducking all around us. Tested with a paddle, the water is more than ten feet deep here, and there are no visible signs of aquatic vegetation. Taking off again with some difficulty, we find the southwestern part of the lake shallow, with rushes plenti-



FIG. 18 (Map 2)—Midnight Lake: Located in a densely timbered country and widely-fringed with rushes. It is a splendid breeding area for diving ducks.

ful. (Fig. 17.) Most of the shoreline is stony, closely bordered by woods and with belts of bulrush. After some circling over the water, the minimum duck population may safely be calculated at 12 birds per acre of water surface.

A short hop over a timbered ridge brings us to Midnight Lake, the shore of which was so overgrown with brush that the character of the soil could not be observed. Here the rushes fringing the shores were more luxuriant than at Helene Lake. Midnight Lake shows about the same density of duck population as Helene Lake but here a large percentage of young birds is present. (Fig. 18).



FIGS. 19-21 (Map 2)—Maiden Lake: The three photos above were taken in rapid sequence (in the order from bottom to top) along a straight line of flight toward the distant shore. Note the continuous density of the duck population.

Maiden Lake, a short distance to the southwest, is the fourth in the chain of lakes which we are following. It is situated in an expanse of level, fairly open country which extends, unbroken by hills, as far as the eye can see.

Precipitation apparently has been somewhat below normal in this section. Numerous mud flats are exposed about the lake and receding water levels have also created many points and bars extending out from the shoreline.

Although Maiden Lake is a comparatively small lake of approximately 1,500 acres, its shallow muddy waters appear to serve as a concentration area for puddle ducks which take wing at our approach. Most of them are mallards. There are at least 8,000 ducks in the air, along the shores and on the water, (Figs. 19-21). We are able to secure a number of photographs in rapid sequence which show the even distribution of the duck population.



FIG. 22 (Map 2)—Stony Lake, Eastern Shore: The water is dotted with ducks and the shadows of those in the air.

After circling Maiden Lake we head westward toward Stony Lake, located midway between Maiden and Turtle lakes. Stony Lake is literally covered with diving ducks, a large percentage of them young birds.

The eastern shore (Fig. 22) is wide, gently sloping, and grassy. The water is dotted with ducks which rise at our approach. The western shore (Fig. 23, next page) is bordered with a wide belt of bulrushes. Apparently a large portion of the lake is shallow. There are at least 20 ducks per acre of water surface. We then continue westward.



FIG. 23 (Map 2)—Stony Lake, Western Shore: Showing its wide belt of rushes extending from the shoreline.

Next comes Turtle Lake, a large elongated body of water. The southern portion of the eastern shore is stony and closely bordered by woods. (Fig. 24.) It is devoid of marsh plants and ducks. As we approach the central part of the lake, we find a duck population of about five ducks per acre over an elliptical area of about two by one and one-half miles in extent. The density



FIG. 24 (Map 2)—Turtle Lake, Eastern Shore Looking Northward. A fine diving duck breeding area.

of duck population increases towards the northern portion of the lake which is shallow, partly open and dotted with numerous small rush-fringed islands. (Fig. 1.) Here there are at least 20 birds per acre of water surface, consisting of diving ducks exclusively. The west shore of the lake, from Indian Reservation No. 115 C southward, is stony and closely bordered by timber. Before leaving, we take another run over the lake and estimate its average density of duck population as a whole at 8 birds per acre.

Brightsand Lake, with its clear and deep blue water, proves disappointing. The shores are stony, crowded by dense woods except along the southern shores, where the growth of timber recedes from the shoreline and growths of bulrushes appear. In this portion of the lake we find five thousand diving ducks.

Of the group of unnamed lakes west of Thunderchild Indian Reservation No. 115 B, the largest lake is bordered by open country on the east and northwest. The remainder of the water is surrounded by trees. A broad sandy beach indicates a recession of the water level. The next unnamed lake about one mile to the westward has a marshy northern end where ducks are numerous. With the exception of its central western part, the lake is crowded in by timber. At least 2,500 surface-feeding and diving ducks are observed on this group of waters.

On we fly along the charted course, continuously on the alert, watching the ground, making notes rapidly, taking pictures, busy every minute.* At 4:30 P. M. we land on Cold Lake for the night. The other plane, which followed a northern course out of Meadow Lake, has already arrived there. Jointly, preparations are then made for the following day's work.

* The description of the route is continued on page 72.

V

A DIGEST OF THE CENSUS AREA

Upon completion of the field work, a mass of information had been gathered which needed coordination and interpretation. All data were classified geographically and meticulously studied. The result affords concise appraisals of the summaries pertaining to the several component parts of the census area and a clear composite picture of the whole. In conjunction with calculating the numerical status of ducks, the studies centered on density of duck populations, duck breeding conditions, the principal causes of losses on the breeding grounds, average size of broods, and other related subjects.

The most interesting feature of this work was the gradual revelation of the number of ducks in various sections of the area and the classification of these sections in their order of importance. Several compact areas densely populated with ducks became apparent, the territorial outlines of which became clearly defined. Others revealed themselves as quite unimportant.

The Agricultural Belt: (Map 1) The developed portion of the census area, composed of the Dakotas, Minnesota, and southern portions of Alberta, Saskatchewan and Manitoba, was found to be very thinly populated with ducks. On this expanse of about 450,000 square miles a conservative estimate reveals a duck population of only 7,600,000 ducks. The average duck population per square mile of land and water is 16.88. This is a composite picture for the agricultural area as a whole, the various parts of which show the following figures—

	Area Sq. Miles	Duck Population	Ducks per Sq. Mile
Alberta, southern section	72,000	1,600,000	22.22
Saskatchewan, southern section	100,000	2,400,000	24.00
Manitoba, southern section	45,000	1,400,000	31.11
North Dakota	71,000	1,200,000	16.90
South Dakota	77,000	350,000	4.50
Minnesota	85,000	650,000	7.65
Totals . . .	450,000	7,600,000	16.88

Each of the above units may be subdivided into sections of varying population densities, revealing local concentrations, and areas barely inhabited by ducks. A sectional breakdown of Minnesota is shown on Map 9.

The Rock Country: (Map 1) Another sector, which is of more or less uniform character and which was found to be thinly inhabited by ducks, stretches across the census area in a broad band from northwest to southeast. It constitutes part of the Canadian or Pre-Cambrian Shield which curves around

Hudson Bay in the shape of a horseshoe of irregular outlines. This is rock country, generally heavily timbered and exceedingly rich in surface waters. In fact, large sections of this country appear to consist of more water than land.

Portions in the Shield were surveyed from the air in the vicinity of Great Slave Lake, District of MacKenzie; Lake Athabaska, Alberta; at several points in Saskatchewan and Manitoba; and in southeastern Manitoba and southwestern Ontario. Frobisher Lake, Churchill Lake, Lac la Ronge, portions of the Churchill River, Reindeer River, and the south end of Reindeer Lake, in particular, were subjects of close examinations. The result may be summed up briefly—



FIG. 25 (Map 1)—Within the Border of the Canadian Shield: Timbered rock country along the western shore of Turnor Lake, Saskatchewan. A Cree Indian settlement in the distance.

Most of the lakes are clear, deep and cold; a very large percentage of them have shallow bays or margins with sparse bulrush growths and thin populations of various surface feeding and diving ducks.

Several sections were found in which ducks were numerous, such as Wapawekka (Pipestone) Lake (especially its shallow and rushy northern shore),

and portions along the Churchill River from Stanley Settlement to the Reindeer River (in particular between Kegg and Trade lakes). Other good breeding areas were reported to exist in limited eastern portions of Frobisher Lake, at Dipper Lake and adjacent Churchill River marshes, in an area extending from Knee Lake to Sandy Lake along the Churchill River, and in several other localities. Lack of time did not permit a survey of these, nor of river deltas and several sandy areas, all of which most likely differ somewhat in character from the general vast expanse of this country of timbered rock and clear waters.

A relatively small area in Manitoba located between the Shield and Hudson Bay constitutes better duck breeding country. But on the whole, in some 270,000 square miles in Saskatchewan and Manitoba, located north and east



FIG. 26 (Map 1)—Frobisher Lake, Saskatchewan: Typical of the larger lakes of the Canadian Shield.

of the southern limit of the Canadian Shield, the duck population is thin and widely scattered, having an aggregate total estimated at 3 millions.

The Best Duck Breeding Country: (Map 1) The remainder of the census area consists of a strip in Manitoba and Saskatchewan wedged between the well developed agricultural region and the rock country, that portion of Alberta north of parallel 53, and a small section of the District of MacKenzie. The area of this remainder comprises somewhat more than one-fourth of the total area under investigation. Yet it was found to contain slightly more than three-fourths of the total number of ducks in the entire census area. The distribution, however, was not uniform. Five areas became conspicuous by their dense duck populations and splendid breeding places. The latter consisted of innumerable small and large units in close proximity, or of vast productive waters and marshes. The five areas are described in Chapter VI. The following details pertain to the rest of the territory in which they are located—

The strip of land in Saskatchewan which is bordered by the The Pas and

the Central Lake areas in the south, and the Canadian Shield on the north may be considered an intermediate duck producing country—a buffer between Saskatchewan's two principal producing sections and the sparsely inhabited rock country. This territory is densely timbered and is rich in surface waters. Steep hills dot it, particularly in the vicinity of Primrose and Dore lakes. Numerous observations at various points indicate that the general character of the area is sandy. This was especially noticeable along the rim of the Shield from the vicinity of Methy (La Loche) Lake southeastward to Whitesand Lake. Much of the terrain is occupied by brushy or timbered muskeg unattractive to ducks. The large waters: Primrose, Methy, Peter Pond (Buffalo), Churchill (Clear), Ile a la Crosse, Canoe, Lac la Plonge, Dore, Smoothstone, Montreal,



FIG. 27 (Map 1)—Methy (La Loche) Lake, Saskatchewan. A small cove on its western shore.

and Candle lakes are clear and deep with sandy or stony shores bordered by timber. The duck populations on these were very thin on the average, although concentrations were noted in spots, such as the southeastern extension of Methy Lake, the Dillon River delta, a few bays on the southern portion of Peter Pond Lake, on Canoe Lake at the outflow of the Canoe River, and in several bays on Lac Ile a la Crosse.

Other waters, such as Linvall and Palmbère lakes (at the edge of the Shield), Niska, Swan, Torch, and a number of smaller scattered lakes showed fair duck populations. However, there are also very densely populated breeding places in the territory, such as McLean, Kazan (Marten), Macallum, Mahi-

gan, and Partridge Crop lakes, sections on the lower Beaver River, portions of Egg Lake, and several marshy areas.

The territory in Alberta, located north of parallel 53 and the northern limit of the Central Lake area (which excludes the northeastern corner) comprising about 146,000 square miles, was relatively lightly covered by the field examinations. The total duck population for this area is appraised at 5½ millions. It is not evenly distributed. Several portions of this area are known to be unattractive to ducks—in particular, the mountainous and rough timbered country in the western portion of the Province from parallel 53 northward to the latitude of Lesser Slave Lake. Other sections were found to be very densely populated by ducks.



FIG. 28 (Map 4)—The Alberta Wilderness: A portion of Fawcett Lake, Alberta.

Accurate subdivisions of this territory, showing the pronounced variations in densities of duck populations, cannot be given in the report, for the contemplated investigation of the territory was only partially carried out. The plans called for a survey from the air of the entire Peace River Valley and the adjoining countryside with specific attention to the vicinity of Fort Vermilion and the northern, easterly course of the river. The route was followed to Lesser Slave Lake where it was abandoned. Here it was found that flood waters had washed out the overland transportation system and no arrangements could be made for obtaining airplane fuel further along the route for the completion of the flight.* However, sufficient information was gathered for an accurate appraisal of the territory as a whole.

* A similar lack of available airplane fuel existed at Chipewyan, on Lake Athabaska. Here, however, the aerial survey work was expedited through the courtesy of the MacKenzie Air Service which permitted us to draw upon their reserve stock there.

At Slave Lake, flocks of surface feeding ducks were observed whizzing over the flooded town. Lesser Slave River, along its winding course to the Athabaska River, portions of Calling Lake, Lake McMillan, and a number of other places were well populated with ducks. Gordon Lake, Garson Lake, and several waters in their vicinity were practically covered with diving ducks and an abundance of surface-feeders. Observations on the ground by co-operators indicate fair duck populations as far west as Lake George, Montagneuse Lake, and Eureka River in the Clear Hills. While the lakes and streams are not as numerous in this territory as in any of the five best duck areas, all indications point to the region being well populated with ducks, particularly along its central western and northern portions.

* * * *

Taking a birdseye view of the three provinces and the three states, one may wonder why large portions of the area are thinly populated by ducks during the breeding season while comparatively small sections hold most of the total population. Food and water conditions, individual preferences of various species of ducks for specific types of nesting grounds, seclusion, and other factors peculiar to various sections appear to exert determining influences.

The greatest attraction on well-populated duck breeding grounds appears to be the abundance and variety of duck foods. Growth of such foods is governed largely by soil and water conditions. Rock country does not permit lush growth; sandy soils may tolerate but not favor it (except in spots where streams have dumped rich silt deposits). This is the case in the Pre-Cambrian Shield and along its western and southern sandy rim. In the agricultural belt, soil conditions are generally fine for the growth of waterfowl plant and animal foods, but here drought and farming activities have a serious affect upon the water supply.

In the light of this year's survey, it is an apparent fact that the prairie nesting ducks now breed in largest numbers and most densely in the timbered country reaching northward from the northern limit of the well developed agricultural region—excluding the rock country and its sandy outer rim.

VI

FIVE OUTSTANDING DUCK BREEDING TERRITORIES

The northern portion of the prairie provinces was made a particular object of study in the course of the survey, due to indications pointing to the existence of very productive duck breeding grounds north of the agricultural belt (see *The Duck Decline in the Northwest*). Investigations of this territory proved most worthwhile, for it was in the northern timber country where the major breeding grounds were found during the survey from the air— five compact areas which stood out conspicuously in contrast with their relatively sparsely populated surroundings. They are:

1. The Central Lake Territory, Alberta-Saskatchewan
2. The Lake Claire Territory, Alberta
3. The Slave River Territory, Alberta-MacKenzie District
4. The The Pas Territory, Manitoba-Saskatchewan
5. The Winnipegosis-Winnipeg Lakes Territory

The location of these five territories is shown on Map 1. In this connection it may be noted that the terrain of the Canadian Provinces slopes northerly and easterly from the continental height of land (Map 1) dividing the waters flowing into the Arctic Ocean and Hudson Bay, and easterly and southerly with the flowage to the Gulf of Mexico and Atlantic Ocean. The height of land itself slopes easterly from the Canadian Rockies. None of the five major breeding areas, however, is located nearer this height of land than about 250 miles.

Altitude above sea level appears to exert no influence prompting the birds to select the five major nesting areas. Each of the territories lies at a different altitude. The western portion of the Central Lake Territory, in the vicinity of Edmonton, is the highest (2400 feet above sea level). The lowest are the Lake Claire and Slave River Territories (700 feet). The The Pas and The Winnipegosis Territories are about 860 and 830 feet above sea level, respectively.

The sizes of the five territories and their duck populations follow—

	Area sq. mi's	Duck population	Ducks per sq. mi.
Central Lake Territory	50,000	10,900,000	218
Lake Claire Territory	3,000	900,000	300
Slave River Territory	16,000	7,300,000	456
The Pas Territory	15,000	3,500,000	233
Winnipegosis-Winnipeg Lakes Territory	15,000	2,200,000	147

The above territories are outlined on Map 1. Separate maps show each territory more in detail, including the limits of the dense breeding areas proper. Brief descriptions of each of the territories follow—



FIG. 29 (Map 4)—Over Meeting Lake, Saskatchewan: A birdseye view of its rushy southern end.

The Central Lake Territory: (Map 4) This is a large, exceedingly productive duck breeding area which extends from the vicinity of Edmonton and Athabaska on the west in an elongated, irregular shape eastward and southward to a point southeast of Prince Albert. It is about 400 miles long with a width of about 100 miles in its western portion. The backbone of this area, which largely shapes it, is a fairly flat, poorly drained elevation which lies between the valleys of the Beaver and Saskatchewan rivers. At the western end of the territory this highland reaches toward the Rockies and, in its extension, divides the Athabaska and Saskatchewan River watersheds. It may be described as a plateau which slopes from an altitude of about 2400 feet in the west, to approximately 1600 feet above sea level in the east.

A glance at Map 4 will show a profusion of large and small lakes with which this territory is dotted. With some exceptions, these are particularly well-populated duck breeding grounds. A large number of lakes also surround this territory, but these are not as popular with the ducks. Those bordering the breeding territory on the south are located in fairly well-developed agricultural country where farming and drought have an adverse affect. Those located north of this breeding area are surrounded by muskeg country or steep timbered hills, particularly in the vicinity of Lac la Biche and toward the west.

The Central Lake Territory lies at the northern limit of the well-developed agricultural belt. Within its southern portions, fields and timber form a mosaic pattern of small and large blocks. Along its southern expanse, timber occupies about one-half of the land. The forested areas are much denser in the northern half of the territory where fields and hay lands comprise from 25% of the land surface in the west to about 10% in the east in the vicinity of Delaronde Lake.

The extent to which this territory is populated by ducks is indicated in the description of a small portion of the route flown therein (pages 23-31).



FIG. 30 (Map 4)—The Winding Reaches of Bunder Lake, Alberta: Diving duck country in the Central Lakes Territory.

The densest duck populations and best duck breeding country in the territory were found in the area represented by Topographical Map No. 366, Saddle Lake, outlined on Map 4.

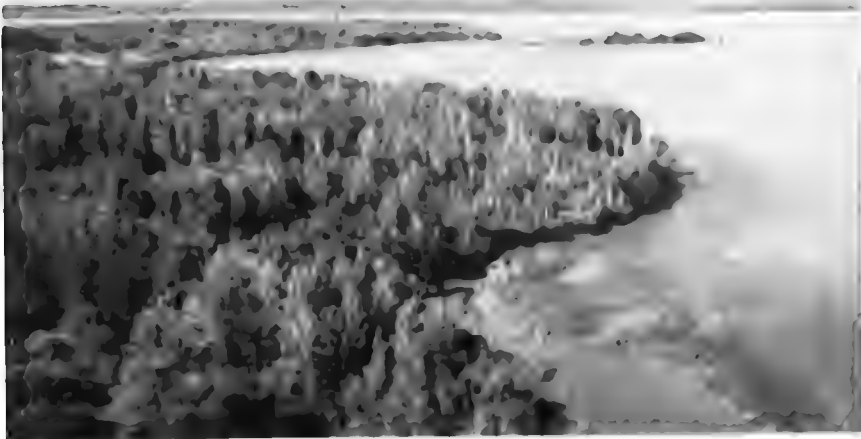


FIG. 31 (Map 4)—Diving Ducks Appear to Prefer This Type of Lake: Part of the northern arm of Buck Lake, Alberta.

The territory is principally diving duck country, although it also contained very large concentrations of surface-feeders. On the long shore of Kinosisu Lake, Tawakwato Lake, and along the south shore of Missawawi (located a few miles south of Lac la Biche, see Fig. 46), young diving ducks lined the rushes for many miles. Other lakes which contained especially large diving duck populations were Reed, Lower Mann (Fig. 45), Lottie, Cyr, Upper Thérien (Fig. 48), Owlseye, Jessie, Charlotte, Mudie, Beaupré, and Mirasty lakes, and several lakes west of the Sturgeon River. On other areas, such as Sinking Lake, the Meadow River-Beaver River marshes (Fig. 47), and Egg and Black Duck lakes, the multitude of surface-feeding ducks greatly outnumbered the diving ducks.

The foregoing are merely a few of the highlights in this territory, an adequate description of which would fill several volumes.



FIG. 32 (Map 5)—Winging Over the Flooded Athabaska River Delta: Abnormally high water levels inundate this section of the Lake Claire Territory.

The Lake Claire Territory: (Map 5) At the western end of Lake Athabaska, lie some 2,500 square miles of splendid duck breeding waters and marshes composed of the deltas of the Athabaska and Birch rivers and the area extending northward to the Peace River and the Rivière des Rochers.

Approached from the south at an altitude of 1,000 feet, the country appeared from a distance as a vast expanse of water. A closer view of its southern border showed a wide belt of irregular, alternating timbered ridges and streaks of open water, traversed by a number of channels defined by rows of tree-tops barely protruding from the abnormally high water, caused by floods. Practically all of the upland between Richardson, Mawawi, Hilda, Baril, and Athabaska lakes was blanketed by water which merged the lakes. The whole area was unlike what one might expect to find from a study of the map.

On criss-crossing the territory by plane, ducks were found to be plentiful in all portions except along the northwestern shore of Lake Claire. Centers of large, bare water surfaces also contained ducks, mostly divers, but thinly distributed. A preliminary survey revealed several areas comprising a total of thirty townships in which the ducks were particularly numerous. About half of these areas bordered the Peace River on the south; three embraced the swollen mouth of the Birch River; the rest occupied the area from the southern end of Lake Claire to Big Point Channel, which comprises the delta of the Athabaska River.

An interesting feature of this densely populated area is that a large eastern portion of it is located within the rock country of the Canadian Shield, the limit of which is shown on Map 5. But here the barren rock was clothed with silt deposited by the rivers. The rock formations are conspicuous at Chipewyan and in the area east of Rivières des Rochers, where the innumerable lakes and

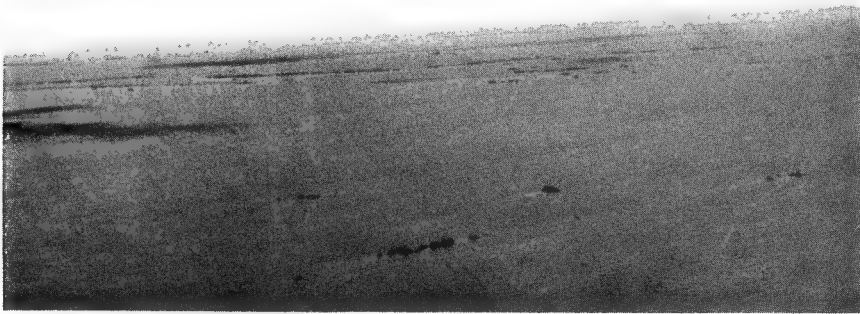


FIG. 33 (Map 5)—Uplands Blanketed and Lakes Merged by Flood Waters: Clumps of protruding tree-tops and water as far as the eye can see reveal the extent of the flood in the Lake Hilda-Lake Claire country.

small waters are typical (and just as unattractive to ducks as the average) of those elsewhere within the Shield. South of the Peace River and Rivières des Rochers, the rock formation crops out in many places but here the top layer of silt fosters abundant growths of waterfowl food and cover vegetation.

The country on both sides of the Peace River is wild and heavily timbered (Fig. 5). Here, too, there was a high stage of water plainly apparent as far west as Peace Point. The group of waters about One Lake is excellent duck breeding country populated principally by mallard, pintail, white-winged scoter, and scaup. Along the route followed from One Lake to the western shore of Lake Claire, most of the upland is taken up by unattractive muskeg country in which the trees become smaller and less dense. The northwest shore on Lake Claire was bordered with growths of scrub willows which stood in very shallow



FIG. 34 (Map 5)—The Water Supply in the Lake Claire Territory Was Ample: Flooded country south of Hilda Lake, Alberta.



FIG. 35 (Map 5)—Only the Higher Lands Topped the Flood Waters: Hilly country bordering the Revillon Coupé, near the mouth of the Peace River.
Here innumerable small ponds were crowded with ducks.

water and spread back over the surrounding level land. To the south of Lake Claire and the Athabaska Delta (Fig. 35), the upland rises in timbered hills. South and southeast of Richardson Lake (Fig. 58), within the Shield, the country is sandy, covered with stunted woods, and dotted with many lakes and ponds (Fig. 59), which were bare of ducks. This sandy country extends northward to Lake Athabaska. It sharply defines the Athabaska River delta east of Big Point Channel. Here the sand country is higher and shows practically no surface waters.

In normal years the Lake Claire Territory most likely supported a duck population larger than observed this year. With the possible exception of Baril Lake, the innumerable large and small waters within its territorial confines are shallow. If the areas inundated by high waters this year are as attractive to ducks as those less affected by flood waters which came under observation on some of the higher ground, this indeed must be a duck paradise. Lake Claire itself is probably a large reservoir of duck foods. Its productivity, however, is apparently greatly affected by winds whipping up high waves which roil the water and tear loose aquatic vegetation.

The Slave River Territory: (Map 6) This northernmost of the areas covered in the 1935 census, lies north parallel 59 and north of the Peace River and Lake Claire. It extends to the southern shore of Great Slave Lake, from the Taltson River delta on the east to a point just west of the mouth of Hay River on the west. The territory comprises approximately 19,000 square miles, of which slightly over 7,000 are in Alberta and the balance in the District of MacKenzie, Northwest Territories.

The Alberta portion of the territory embraces the southeastern lake region of the Alberta plateau in Wood Buffalo Park, the salt plains which lie just



FIG. 36 (Map 6)—At Great Slave Lake: Swampy delta of the Slave River.



FIG. 37 (Map 6)—A Waterfowl Paradise: Typical section of the Salt Plains extending over hundreds of square miles in northern Alberta west of Slave River.

west of Slave River and a comparatively narrow strip of well-watered woodland lying on the east bank of the Slave River south of Fort Smith.

That portion of the territory which lies in the MacKenzie District includes the plains along both banks of the Slave River, which are quite swampy, the deltas of the Taltson and Slave Rivers, and the vast swampy area lying to the westward. This western portion is well-watered, including the Little Buffalo, Nyarling, and Hay rivers, and Buffalo Lake—together with numerous small ponds.

As before stated, the Lake Claire area appeared to be somewhat below its duck producing capacity, largely owing to the flood conditions which prevailed. The Slave River district, on the other hand, provided one of the surprises of the trip.

Ducks were encountered in the over-flow country along both banks of the Slave River immediately north of the junction of the Peace River and Rivière des Rochers. Upon leaving the timbered country, we came upon the salt plains area which lies west of the Slave River. This is an extensive marshy lowland with occasional sparse tree growths. The plains are studded with innumerable small water areas. The predominant growth is a marsh grass which in late August was greenish-brown. Every available water area, including potholes of a few square yards, was found to contain ducks, about 80% of which were surface-feeders of about flying age. The duck population was virtually uniform over hundreds of square miles in the salt plains area.

South of Fitzgerald lies a long marshy slough extending north and south for a distance of ten miles and varying in width from $\frac{1}{2}$ to $2\frac{1}{2}$ miles. The water in the slough contains a fairly good growth of reeds and rushes, and an abundant growth of aquatic plants. The surrounding land is sparsely wooded and here, too, there were myriads of small water areas. On this slough both surface-feeders and diving ducks were found in tremendous abundance. Mal-

lards, pintail and white-winged scoters predominated, but there was a good representation of canvasbacks, redheads, and a few scaups. It was particularly noticeable that, with the exception of scoters, none of the diving ducks were of flying age.

The plains area northwest of Fort Smith, east and west of the river, is another concentrated duck producing area. It consists of marshy lowlands containing literally myriads of small, shallow water areas, from pothole to pond size, interspersed with occasional trees. In this large area, the duck population varied. Careful observation of approximately 700 square miles of this section showed a density of population running from three to as high as twenty birds per acre of water surface. A very large percentage (probably 85%) of the

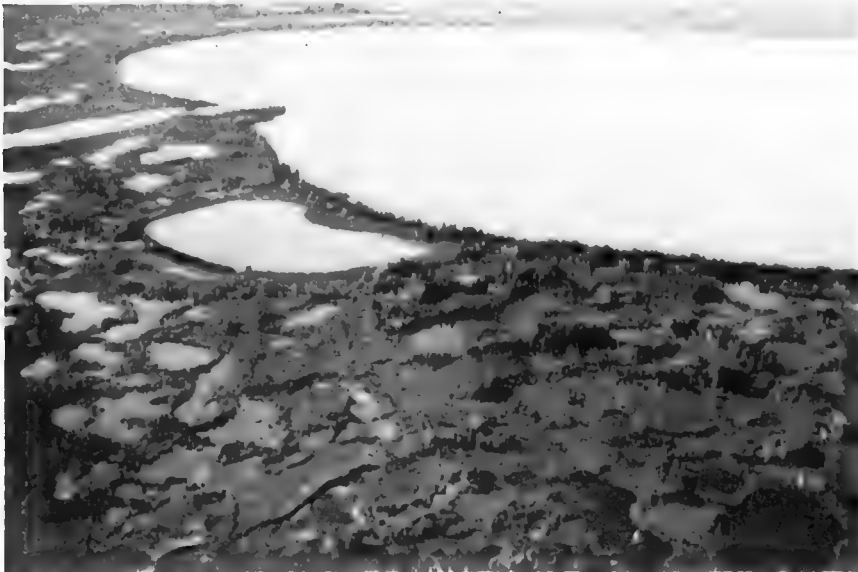


FIG. 38 (Map 6)—Myriads of Potholes Dot This Section of the Slave River Area: One of the unmapped lakes about midway between Fort Resolution and Hay River, Northwest Territories.

total duck population consisted of young birds. Roughly 65% of the birds observed in this area, which supported mallard, pintail, blue- and green-winged teal, scoter, scaups, redhead, and canvasback, were below flying age.

The Slave River at its mouth spreads out to form a delta of slightly over a hundred square miles. Due to high water conditions, the river had cut many new channels not shown on the map and had overflowed many of the old channels. Here we found a large concentration of ducks, all of which were of flying age.

The Taltson River flows in a northerly direction into Great Slave Lake approximately thirty miles east of Resolution. Near the mouth of this river are Gaudet and Taltson bays, both of which contained a very heavy population of ducks, chiefly surface-feeders.

The south shore of Great Slave Lake west of Resolution is generally densely wooded with several high bluffs. Very few birds were present along the lake shore, but in the country to the south, which is extremely well-watered, several lakes, not indicated on the map, proved to be duck concentration areas. Not all of the water areas on the south shore of Great Slave Lake, however, are attractive to ducks, as there were many which contained clear water and were devoid of vegetation.

The very large number of young ducks of non-flying age observed in portions of Slave River Territory, such as in the salt plains of Wood Buffalo Park and the plains northwest of Fort Smith, proves that this territory was one of the greatest producing areas on the continent this year. Density of population was so great in several areas as to raise the question of where so great a number of birds found a sufficient supply of food.



FIG. 39 (Map 6)—In Northwest Territories: Potholes among the timber bordering the Taltson River near its delta at Great Slave Lake.

The The Pas Territory: As shown on Map 7, this is an irregularly-shaped area lying in Saskatchewan and Manitoba. That portion of it lying in Saskatchewan is bounded on the south by the heavily wooded Pasquia Hills. The western limit of the territory is in the neighborhood of Kennedy and Red-earth lakes, about twenty-five miles west of which the country becomes higher and densely wooded with practically no water. In general, the northern and eastern limits of the area are formed by an irregular line running along the south shore of Deschambault Lake through Amisk, Cormorant and Reed Lakes to the northwest corner of Cedar Lake. From Cedar Lake the line runs west



FIG. 40 (Map 7)—East of The Pas: A succession of fine duck breeding ponds and marshes cover this portion of the territory.

along the northern shore of Lake Winnipegosis through Red Deer and Salt Lakes, and thence northward along the Pasquia Hills to Willow Lake.

The Saskatchewan River flows through this entire territory from the west to east. The Carrot River winds profusely through the western portion of the area and empties into the Saskatchewan just west of The Pas.

This is limestone country. It includes many large lakes, several of which, like Cumberland Lake, are really wide shallow areas created by the overflow of rivers. While the latter are permanent bodies of water, their areas depend to



FIG. 41 (Map 7)—The Saskatchewan River Overflow Forms Numerous Lakes: Channels of the river near their junctions with Cumberland Lake.

a great extent on water conditions in the rivers which feed them. During August, 1935, water in the rivers was low and extensive marshy areas around several of the lakes had dried up completely.

Many otherwise excellent breeding grounds in this territory were adversely affected during the 1935 breeding season by low water. Here damage was caused also by extensive burning of marshes by trappers at a number of points, particularly around The Pas and Cumberland Lake.

A small but very productive portion of the The Pas area lies on the northwest corner, south of Moose Lake. Here, Thomas Lamb, Jr., has leased approximately 50,000 acres of marshland from the government and is operating a muskrat ranch. By a systematic control of water levels, Mr. Lamb has created an ideal breeding territory which produces a great variety of ducks, including



FIG. 42 (Map 8)—Ample Precipitation Occurred in The Winnipegosis-Winnipeg Lakes Territory: Flooded marshes of Lake Dauphin.

mallard, teal, ruddy, blue- and green-winged teal, pintail, canvasback, ring-necked duck, shoveller, white-winged scoter, and both species of scaup.

While the duck population in the The Pas Territory was not as dense as in other areas investigated, it undoubtedly once was a great producing area in which, under more favorable conditions, the duck breeding situation should improve from year to year.

The Winnipegosis-Winnipeg Lakes Territory: (Map 8) This area joins the The Pas Territory on the southeast. It extends from Cedar Lake on the north down the westerly shore of Lake Winnipegosis as far as the southerly end of Lake Dauphin. The southern limit is approximately at the 51st parallel. On

the east, the territory is bounded by the westerly shore of Lake Winnipeg as far north as Grand Rapids.

The soil in the territory consists of a combination of muck and peat deposits and the silty beds of former lakes and flood plains. In the northern portion there is considerable limestone. Much of the southern portion of the area is farmed. The area contains many sizeable lakes on which the ducks populations run from zero to a rather high density.

Perhaps the most interesting portion of the territory is Waterhen Lake which is famous as a canvasback breeding ground. This lake has an area of approximately 125 square miles, and is bounded on the east by sparsely wooded upland. A good deal of the surrounding country is farmed; much of it is in swampy lowlands interspersed with a number of sizeable water areas and many smaller ones. The land along the western shore of Lake Winnipegosis is low and marshy but not very well watered.



FIG. 43 (Map 8)—A Famous Canvasback Breeding Ground: Portion of Waterhen Lake.

Throughout the major producing portion of the territory, water conditions were fairly normal during 1935. Food and cover plants were in very fine condition. The water in Lake Dauphin was high with the result that in numerous places the banks had overflowed considerably.

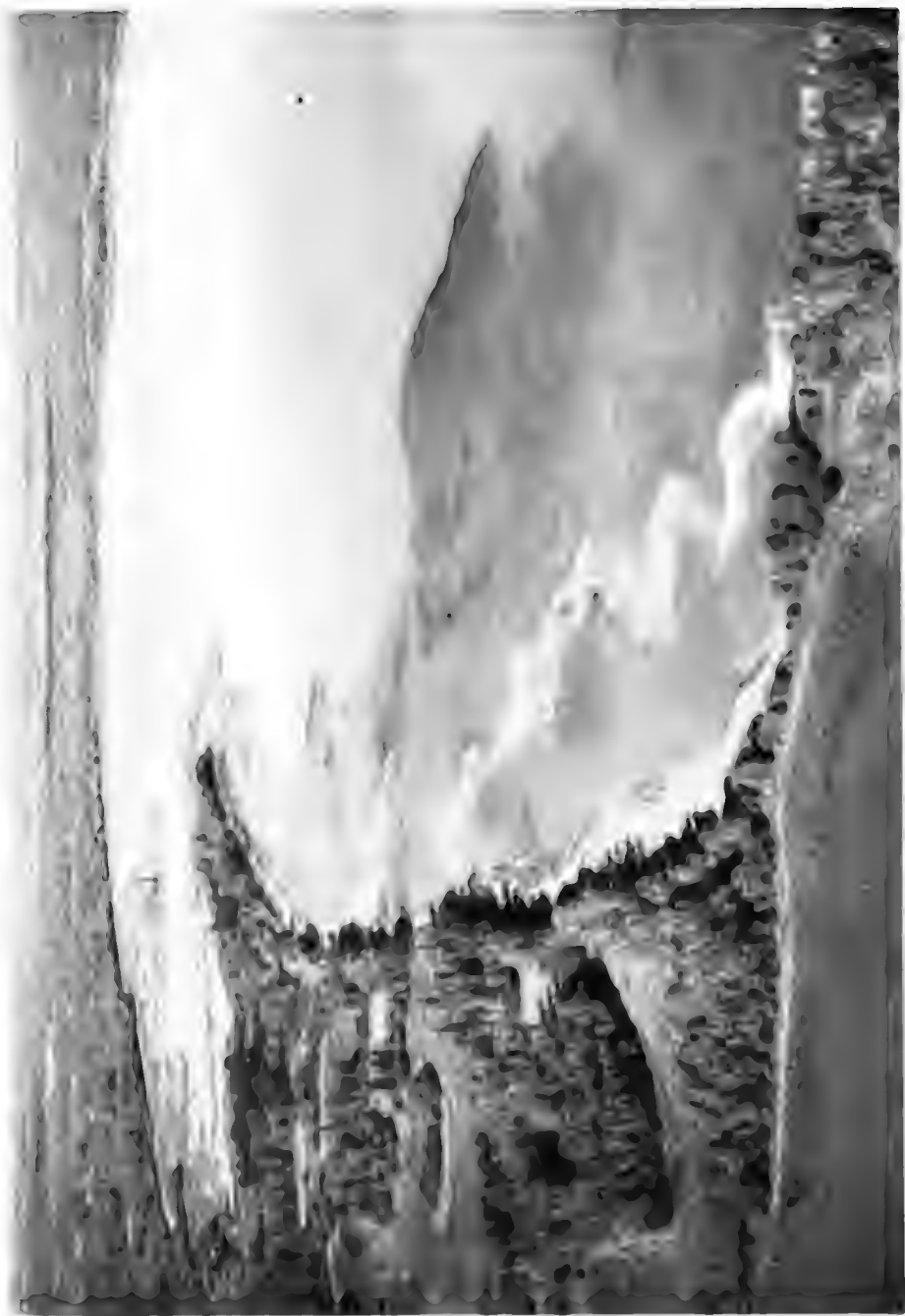


FIG. 44 (Map 4).—Typical Shoreline of An Excellent Duck Breeding Lake in the Central Lake Territory, Roshchinskaya More with patchy open upland nesting cover at the southern end of Barnes Lake, Saskatchewan.

VII

DISTRIBUTION OF SPECIES, RELATIVE PROPORTION OF SEXES, SIZE OF BROODS, AND RATE OF INCREASE

What species of ducks are most numerous in the agricultural belt during the breeding season? Where do most of the diving ducks breed? How many wild geese, approximately, nest in the entire area? These and similar questions have never been answered heretofore. The information gathered during the census makes the following conclusions possible—

Distribution and Relative Abundance

In the Agricultural Area. The agricultural portion of the area investigated is inhabited chiefly by surface-feeding ducks during the breeding season. This is clearly indicated by the returns of cooperators who made field investigations on the ground. The figures show that surface-feeding ducks outnumber diving ducks in an approximate proportion of five to one.

Mallards were reported more numerous in this area than any other kind of ducks. In South Dakota and Minnesota more teals (blue- and a small percentage of green-winged) were reported than mallards. The table on page 53 shows the relative abundance of each species on the basis of reports filed by the census takers.

In the agricultural belt, potholes, small shallow ponds and lakes were reported as the best duck producers. These are the types of breeding spots frequented principally by the surface-feeding ducks— and they also are the most severely affected by drought conditions. In some sections nearly all such small breeding places (the cream of production areas) have dried up. Species which formerly nested therein were not found in many of these localities during the 1935 breeding season for that reason.

The foregoing and similar interesting facts can be revealed by systematic field investigations. For example, Map 9 shows the distribution of the duck population in Minnesota as it appeared in the light of the 1935 census, the outlines of the eight census districts in the state (see page 68) and their duck populations. Listed on the map also are the ten best duck breeding counties. Lack of space on the map prevents the depicting of other features, such as the distribution by species and their relative abundance by counties.

In the Northern Area. In the territory covered by airplanes, lack of time prevented a study similar to that carried on in the agricultural area. However, it was ascertained definitely that the timbered north country is inhabited mainly by diving ducks. They were observed there in dense numbers, mostly on the

NUMBERS OF DUCKS BY SPECIES AS REPORTED BY COOPERATORS IN THE AGRICULTURAL PORTION OF THE CENSUS AREA

Species	Total	Percentages of Total	Alberta	Saskatchewan	Manitoba	North Dakota	South Dakota	Minnesota
Mallard	483,647	38.92	176,825	56,038	31,496	27,935	31,141	160,212
Teal (bl. & gr.-w.)	304,376	24.49	54,493	15,505	16,072	13,928	39,279	165,079
Pintail	169,711	13.66	68,421	12,055	20,238	18,842	27,914	22,241
Shoveller	76,292	6.14	15,598	5,341	11,529	9,007	24,328	10,489
Scaup	58,033	4.67	23,664	1,793	242	1,082	18,580	12,672
Bufflehead	42,926	3.45	42,226	305	242	95	19	39
Canvasback	41,566	3.34	18,949	5,282	11,482	3,050	2,163	640
Widgeon	16,228	1.30	3,641	399	8,961	1,999	508	720
Redhead	16,639	1.34	2,808	79	9,111	2,483	137	2,021
Gadwall	12,112	.97	3,102	3,112	1,291	2,510	838	1,259
Golden-eye	9,541	.77	7,781	....	....	331	....	1,429
Scoter	6,417	.52	6,392	17	....	....	....	8
Ruddy	2,830	.23	48	....	330	1,179	80	1,193
Wood Duck	2,320	.19	....	....	....	24	16	2,280
Ring-necked	125	.01	....	....	....	....	....	125
TOTAL ...	1,242,763	100.00	423,948	99,926	111,014	82,465	145,003	380,407
Unidentified	670,860	....	99,434	65,943	54,184	273,251	114,178	63,870
	1,913,623	....	523,382	165,869	165,198	355,716	259,181	444,277

larger waters. On some of these lakes certain diving species outnumbered all others. Most numerous were the scaups. Here are a few examples—

Name of Lake	Province	Feet Above Sea Level	Species	Predominating
Gypsy	Alberta	1480	Canvasbacks	
Helene	Saskatchewan	2360	"	
May	Alberta	2050	"	
Niska	Saskatchewan	1382	Scaups	
Mudie	"	1740	"	
Mahigan	"	1575	"	
Beaupre	"	1560	"	
Upper Therien	Alberta	2086	"	
Reed	"	1903	"	
Nadeau	"	1960	"	
Baptiste	"	1980	White-winged scoters	
Methy (s. end)	Saskatchewan	1450	Scaups, w. w. scoters	
Missawawi	Alberta	1865	" " "	
Kinosiu	"	1867	" " "	
Gordon	"	1430	Canvasbacks, scaups	
Garson	"	1637	" "	
Kazan (Marten)	Saskatchewan	1425	" "	
McLean	"	1570	Canvasbacks, redheads	
Macallum	"	1420	Canvasbacks, redheads, scaups	
Charlotte	Alberta	1805	"	"
Lower Mann	"	2017	"	"

On a few large northern lakes, surface-feeding ducks were in the majority—mostly old birds and nearly mature young. All were strong on the wing. These lakes apparently were concentration areas for birds from neighboring small



FIG. 45 (Map 4)—Lower Mann Lake, Alberta: Showing the type of lake where canvasbacks, redheads and scaups predominate.



FIG. 46 (Map 4)—Shore View of Missawawi Lake, Alberta: Typical of larger water preferred by scaups and white-winged scoters. Note strip of smooth water inside the belt of rushes which ducklings frequent during windy weather.

waters where most of the young probably were hatched. On some extensive land areas dotted with potholes, ponds, and lakes, multitudes of rather young surface-feeding ducks also were observed, notably in the following areas in Saskatchewan (Map 4): Southeast of Witchekan Lake in an area extending from the railroad tracks between Spiritwood and Mildred north by east to the Big River; east of Eldred and Sob lakes; south of Ranger between Barnes and Twinbay lakes. In several places diving ducks and surface-feeding ducks appeared to be present in about equal numbers. Here are some of the details—

Name of Area	Province	Feet Above Sea Level	Species	Predominating
Stony L.	Saskatchewan	2180	Mallards	
Sinking L.	Alberta	1817	"	
Mirasty L.	Saskatchewan	1670	Mixed	surface-feeding ducks
Meadow L.	"	1620	Mixed	diving and sur- face-feeding ducks
Meadow River Delta.....	"	1512	"	" "
Lake Claire	Alberta	699	"	" "
Cooking L.	"	2419	"	" "
Jessie L.	"	1803	"	" "
Lawrence L.	"	2060	"	" "

Wild geese, although not included in the census, were reported on by some field workers. In the three states and provinces, only Canada geese were found. Their numbers are inconspicuous—all indications point to a total goose population in the entire area, exclusive of the section in Manitoba located be-

tween the Shield and Hudson Bay, of less than ten thousand. Small local populations were observed in the following places (the figures show the numbers reported in each place)—

Beaverhill Lake, Alta.	25	Charles Mix County, S. D.	28
Redberry Lake, Sask.	600	Kandiyohi County, Minn.	5
Eddy County, N. D.	17	Martin " "	36
Nelson County, N. D.	8	Stevens " "	10
Bon Homme County, S. D.	38		
		Total	767

In the northern portion of the area, reports on a number of goose nesting grounds were received. Investigations, however, proved these reports to be incorrect. In the territory surveyed from the air, wild geese were observed in only two instances: Twelve birds in flight over muskeg country ten miles north of



FIG. 47 (Map 4)—River Bottoms Attract Mixed Populations of Diving and Surface-Feeding Ducks: The Meadow River delta, Saskatchewan.

the Grand Rapids on the Athabaska River, Alberta, and approximately three hundred and fifty adult and young birds on Little Point Lake (near Peter Pond Lake), Saskatchewan. Obviously, the prairie duck breeding range has become insignificant in its production of wild geese. Pelicans, on the other hand, have been observed in a number of localities along the routes followed by airplane.

Relative Proportion of Sexes

During recent years, the statement has frequently been made that male ducks outnumber females to a great extent. This subject is of interest, for an excess of drakes over females would affect the rate of reproduction of the total breeding stock.

Observers in the field were asked to report on the situation in their respective localities, but the breeding season was too far advanced to obtain reliable

answers to the question. Adult ducks in the agricultural area were in eclipse plumage and only occasionally was it possible for those acquainted with their color changes to distinguish males from females. The presence of almost mature young birds made the work even more difficult. Some ducks were identified as drakes by their calls. The matter of sex determination, however, was ruled out this year. Investigations to determine the relative proportion of sexes should be conducted early in the breeding season.



FIG. 48 (Map 4)—A Popular Scaup Nesting Area: An arm of Upper Thérien Lake, Alberta. Note the fine blending of marsh and upland growths on the further shore.

Size of Broods

What success did mother ducks have in raising broods this year? According to reports of most field investigators, the average duck families were large, and up to the first half of August the breeding season was, on the average, very good in the three states and the southern portions of the three provinces.

The summaries of the counts reported by the field observers for each of these areas and the totals are as follows:

Area	1 No. of Brood Reports	2 Females with Broods	3 Young Ducks	4 Old Ducks Without Broods	5 Average Size of Broods
Southern Alberta	257	51,673	300,684	171,025	5.82
Southern Saskatchewan	294	19,568	98,967	47,334	5.06
Southern Manitoba . .	97	14,750	86,064	64,384	5.83
North Dakota	135	9,098	64,268	282,350	7.06
South Dakota	290	25,938	157,629	75,614	6.08
Minnesota	422	30,672	196,310	217,295	6.40
Totals	1,495	151,699	903,922	858,002	5.96

The average of 5.96 ducklings per brood during early August, for the agricultural area as a whole, might appear too high. Figures pertaining to other years are not available for comparison, however. Check figures for this year were arrived at by tabulating separately reports representing the most careful field work, such as reports of trained field investigators (ornithologists, game officials, bird students, etc.) and of those who have shown meticulous care in the preparation of returns (many of which were filed with supporting field data). The average number of ducklings arrived at from such handpicked returns is somewhat smaller than the average figures shown above.

On the basis of efficiency or luck, scaups had the largest average families. A tabulation of all returns from the agricultural belt shows the following average number of ducklings per brood by species—

Species	Females With Broods	Young Ducks	Old Without Broods	Average Broods
Mallard	48,140	284,025	151,482	5.90
Teal (bl. and gr.-winged)	25,324	148,739	130,313	5.87
Pintail	14,648	93,380	61,683	6.37
Shoveller	7,421	48,185	20,686	6.49
Scaup	5,746	41,010	11,277	7.14
Bufflehead	5,135	30,784	7,007	5.99
Canvasback	5,940	28,357	7,269	4.79
Widgeon	1,682	10,628	3,918	6.32
Redhead	2,028	11,742	2,869	5.79
Gadwall	1,251	7,869	2,992	6.29
Golden-eye	771	5,037	3,733	6.53
Scoter	827	4,285	1,305	5.18
Ruddy	211	1,182	1,437	5.60
Wood Duck	167	1,141	1,012	6.83
Ring-necked . . . . .	....	....	125	...
	119,291	716,364	407,108	
Unidentified	32,408	187,558	450,894	5.79
Total	151,699	903,922	858,002	5.96

In the study and tabulation of the reports, an appraisal was made of the extent to which returns of field observers may be relied on. It was found that relatively few returns appear to lack accuracy. The large majority of field reporters did the field work with precision. Some described the kind of ducks in their respective areas by local terms (often learned from the Indians), such as "squawking duck", "long necks", "whistling wing divers", and "grannir duck". In tabulating the reports, it was in some instances difficult to find the correct interpretation of some local terms. The terms "black duck" and "fall duck", which are in common usage in the provinces, proved most troublesome. They may apply to scaup, white-winged scoter, bufflehead, and golden-eye—any or all of them, depending on local custom. Wherever the proper meaning of local names given was not clear, the figures were added to the columns listing species not identified. This column was also added to by field investigators for other obvious reasons: Poor light conditions at the time observations were made, eclipse plumage, unfamiliarity with species uncommon locally, etc. Those who have shown their candid spirit in this manner have rendered their reports more valuable. This, despite the fact that were the details pertaining to the "unidentified" column known, a more accurate picture could be formed on the relative proportion of species, notably those less common, and their brood counts.

Rate of Increase

Next to the total number of ducks, preferably by species, the most important information that duck censuses on the breeding grounds should disclose is the rate at which the ducks increase. This is an excellent indicator of the year's duck crop.

To establish the rate of increase, it is necessary to ascertain the total number of young birds and, separately, the total of old birds. Figures on average sizes of broods are helpful in computing the total of the growing crop in large areas which cannot be thoroughly investigated. Certain it is that such figures do not represent the rate of reproduction, for it is well known that not all birds pair off and breed, not all nestings are successful, and not all ducklings survive.

For example, let us assume that on a quarter section of land (160 acres) the total number of mature birds consists of 12 male and 8 female ducks and that 5 of the females have 40 ducklings late in July. At that time the rate of increase would be 2 per adult bird, 2.5 per paired bird, and 5 per female. The 4 drakes and 3 females without broods give the unproductive duck population. The average size of brood per mother duck is 8. Barring subsequent losses, the quarter section would produce a crop of 40 ducks. It may be seen that the average size of broods, the total number of old birds without broods, and the proportion of sexes of adult birds are valuable factors in checking the accuracy of such computations—especially so if the figures are ascertained by species and the approximate age of the ducklings are reported on.

What is the rate of increase in the agricultural belt this year? The summaries compiled from the reports of field investigators, as shown in the table on page 58 give the following figures: Southern Alberta 1.35*, Southern Saskatchewan 1.48, Southern Manitoba 1.09, North Dakota 0.22, South Dakota 1.55, Minnesota 0.79, and for the all of these areas combined an average of 1.12 per adult bird, or double the foregoing figures per pair of adult birds.

These figures, however, do not represent the actual condition as it existed. They are too low. The reason is that during the latter half of the census young birds of early nesters were nearly mature, strong on the wing, and in mixed flocks. It became impracticable to distinguish old from young and, in many instances, young birds were reported as old birds without broods. Thus, the figures in column 4 of the table (page 58), which should reflect the combined numbers of old drakes and of broodless females which were unsuccessful in producing young, are inflated and do not represent true proportions. In the future, the number of old ducks present on the breeding grounds should be ascertained earlier in the breeding season.

*51,673 females with broods (column 2) plus 171,025 old ducks without broods (column 4) give a total of 222,698 old birds, compared with 300,684 young ducks (column 3).



FIG. 49 (Map 4)—The Heavily Timbered Muskeg Country of West Central Saskatchewan: Type of terrain near Chitek Lake.

VIII

MAIN CAUSES OF LOSSES ON THE BREEDING GROUNDS

Good duck crops are dependent upon adequate breeding stocks, large hatches, and few casualties. That nests and ducklings are lost no one will question. The yearly extent of the losses and their main causes, however, have never been ascertained. In identifying factors chiefly responsible for mortality, interesting conclusions may be drawn from the first-hand observations of those acquainted with the duck breeding grounds—farmers and others, who have reported in their census returns what is actually happening in their own localities.

The causes of losses may be classified as follows—

1. Weather conditions
2. Natural enemies
3. Agricultural activities
4. Prairie and forest fires
5. Disease

Lacking definite data on the frequency of occurrence and relative effectiveness of each of the foregoing, it is not possible to classify them in their order of importance. Obviously their destructiveness will vary from year to year, since some appear to have full play every year practically throughout the breeding season, whereas others are effective occasionally and with varying intensity.

Weather Conditions. Weather is an example of one of the fluctuating causes of waterfowl mortality. Drought during the breeding season causes the death of ducklings in the agricultural belt. Drought at the beginning of the breeding season is not nearly so destructive as drought following a wet spring. Obviously so, for then the ducks, instead of nesting on temporary water areas soon to become dry, breed in the vicinity of more permanent waters where subsequent dry spells have less effect upon broods. But if a wet spring is followed by a dry summer, the smaller water areas become death traps for ducklings. The species affected most severely by drought are the surface-feeders, in particular those which have a relatively small breeding range.

Too much rain during the breeding season also plays havoc on the breeding grounds, for floods wash out nests. Flood waters may blanket many square miles of upland nesting grounds and submerge nests built well above normal water levels. They may undo the nesting efforts of surface-feeding and diving ducks alike or merely those of some species, depending largely on the time at which the floods occur. Floods early in the breeding season may destroy nests of mallards, pintails, canvasbacks, and other early breeding species, without affecting the nests of late breeders, such as white-winged scoters and ruddy ducks. Similarly, the reverse may occur in the case of late floods.

Frost and cold weather may be the cause of serious losses. It is said that a severe frost late in the spring freezes eggs, despite the protective covering of

down—particularly those eggs in nests in exposed positions. Cold, rainy weather is destructive to ducklings. Young birds need warm, sunny weather for good growth at the start. On the prairie duck breeding grounds, there is no definitely limited hatching period. It is rather a continuous process in which early-nesters take the lead. Early hatched ducklings are well advanced in growth when the eggs of later nesting species hatch. Very young birds may be observed at any time during the breeding season; hence, cold weather is a menace on the breeding grounds. Early frosts in the fall are added hazards to the survival of ducklings hatched late in the season.

Hail, too, may cause heavy losses among young ducks, notably in southern Alberta. In that province hailstones are reported to attain considerable size and destructive capacity.



FIG. 50 (Map 5)—Too Much Water This Year: Flooded countryside along Hay River, Alberta.

Here is a brief summary of reports on weather conditions on the breeding grounds this year—

Drought had little effect on the duck crop. Precipitation in many sections was ample and frequent, filling many potholes and small water areas and causing a rise in the levels of many lakes. Ample moisture conditions gave the greater part of the agricultural area a lush appearance—in marked contrast with the parched conditions observed during the Foundation's survey in July, 1933. Small surface waters were numerous and obviously new since they were still supporting typical upland grasses and plants. Many such areas were barren of ducks. Compared with the breeding season of 1933, a wider dispersal of the duck population was apparent this year. Areas formerly barren of ducks were populated again, while some areas which were densely populated in 1933, such as the Qu'Appelle River marshes, supported a much smaller number of ducks.

Drought conditions were still severe in limited areas of the agricultural belt, notably in a rather large section, the approximate boundary of which extended from the vicinity of Medicine Hat to Sullivan Lake, Alberta, thence to Manito Lake, Saskatchewan, thence southwestward to Johnston Lake, Saskatchewan, and back to Medicine Hat.

Precipitation was unusually heavy in northern Alberta. Heavy run-off from the mountains caused a rise of several feet in the level of Lake Athabaska, flooding the adjacent lowlands south of the Peace River and in the Athabaska River delta. Local observers stated that the peak of the flood occurred after most of the early nesters had hatched their eggs. The damage caused by this flood probably was light since many young ducks were observed in this area late in August.



FIG. 51 (Map 1)—Lesser Slave Lake Out of Bounds: The town of Slave Lake, Alberta, in August.

Lesser Slave Lake and the vicinity of Peace River were the scenes of severe floods during late July and August. It was reported that these floods damaged the local duck crops to but a small extent. This appeared to be the case also in the extensive marshes located at the southern ends of Lake Manitoba and Lake Winnipeg which were flooded by high waters driven many miles inland by strong north winds. These marshes, which have suffered during the recent drought years, have become lush again this year. Local observers reported that they have found several thousand duck eggs washed ashore by the rising waters. In the Delta marshes, south of Lake Manitoba, census takers found a deficiency in the number of young ducks during mid-August.

In the southern portions of the provinces, late winter weather prevailed well into spring according to reports, and seasonable warm weather did not set



FIG. 52 (Map 7)—Drought Conditions Were Still Severe in Limited Areas: Dried up marsh bed south of Cumberland Lake, Saskatchewan.

in until late June. This may have been the cause of the large number of very young birds observed in numerous sections, notably young diving ducks in the northern lakes. Warm weather in the fall appeared necessary for proper development of these ducklings.

Natural Enemies. Among the causes of mortality on the duck breeding grounds, natural enemies are prominently mentioned in the reports of field observers throughout the agricultural area, as may be seen from the table on the opposite page, which is a summary of all reports received.

In the opinion of these observers, the crow is the worst natural enemy of the ducks on their breeding grounds. Of 551 who reported mortality factors, 366 have mentioned crows, often emphatically.

According to all accounts, crows are on the increase. They were reported to be particularly numerous along the northern rim of the agricultural area. Apparently their summer range is spreading northward well into the timbered country, where their presence in several places has recently been noted. Local observers stated that some crows are beginning to winter on a few northern lakes, eking out an existence from rough fish and offal left on the ice by fishermen. Hard-pressed for food early in the spring, such wintering crows are said to be particularly destructive to duck eggs. In the marshes south of Lake Manitoba, persecution has apparently driven crows to nesting in the marshes—in close proximity to nesting ducks. Destruction of eggs and ducklings by crows, it is reported, affects the early breeding species most severely, since they begin to nest at a time when vegetation is in early growth and too thin to conceal their nests.

Cooperators in Minnesota listed turtles as one of the main enemies of ducks. This may be considered to be the case on most breeding grounds in the states.

The table on page 65 discloses a rather long list of natural enemies of ducks on their breeding grounds. Many of these can be kept under reasonable control.

NATURAL ENEMIES REPORTED DESTRUCTIVE TO DUCKS ON THEIR BREEDING GROUNDS

Species	Alberta	Sask.	Number of Cases Reported			Minn.	Total
			Man.	So. Dak.	No. Dak.		
Crows	86	92	37	17	76	58	366
Hawks	56	36	9	11	44	37	193
Coyotes	34	19	2	5	4	5	69
Owls	21	15	3	2	8	16	65
Turtles .....	..	..	6	..	13	38	57
Skunks	27	3	2	..	13	9	54
Cats	11	3	..	11	5	19	49
Magpies	37	8	..	1	1	..	47
Foxes	7	2	1	..	2	9	21
Weasels	13	2	..	..	1	2	18
Gulls .....	..	2	3	1	2	1	9
Fish	5	2	..	..	..	1	8
Dogs	3	1	..	..	..	2	6
Eagles	3	..	..	..	..	..	3
Unclassified .....	..	19	3	2	2	9	35
	303	204	66	50	171	206	1,000
No. of cooperators reporting	104	149	50	39	93	116	551

Agricultural Activities. Grazing, plowing, and the mowing of hay are agricultural activities which take a toll of eggs, ducklings and, occasionally, mother ducks. Surface-feeding species are chiefly affected, since they constitute the main population in the agricultural belt. In this matter the farmers and land-owners obviously are entitled to consideration. Many a brood could be saved



FIG. 53 (Map 1)—Flood Waters, Driven Inland by High Winds, Flood the Marshes South of Lake Winnipeg: Mallards rising from a floating haystack.

if farmers were compensated for protecting well-frequented nesting grounds. Even now many a nest is being spared by watchful and sympathetic farmers when mowing crops. But in many places it has been found that protective vegetation left uncut around nests in mowed fields forms conspicuous marks, easily detected by crows and other natural enemies which, in most cases, destroy the eggs the farmers endeavor to save.

Prairie and Forest Fires. The burning of old vegetation during early spring is not a universal practice in the agricultural belt. It is resorted to occasionally to foster new growth on grazing lands or to clear stubble fields for plowing. Stubble is most frequently burned in the fall. It is the incidental prairie and forest fires which destroy most of the nests lost through burning. During the survey of the northern areas from the air, several large sections in close proximity to lakes were observed which recently had been burned over. At times the cause of fires on certain areas is unusual. For instance, at Cumberland Lake, Saskatchewan, and in the vicinity of The Pas, Manitoba, trappers burned off (in May) hundreds of square miles of marshes in the hope of controlling a disease which has caused great losses among muskrats. A qualified observer, who investigated the area after the fire, estimated the number of burned duck nests on a small section of the burned over area at a minimum of 10 per acre. It should be possible to limit losses due to fire.

Disease. Ample water in the fall has greatly reduced losses from the western duck sickness which in drier years has caused the death of very large numbers of ducks in certain shallow waters in the agricultural belt. Indians inhabiting the Lake Claire area reported ducks dying from disease. These reports appeared to be unfounded this year, for in the extensive coverage of the area from the air only two dead ducks were observed. Large losses among ducks have occurred during late July and August of this year in southern Alberta and in the vicinity of Lake Stobart. The cause was variously attributed to the western duck sickness and to sickness and strangulation caused by leeches which entered the nostrils of the birds. Duck sickness was reported also at Poinsett and Dry Lakes, South Dakota.

The following table summarizes the causes of losses reported by cooperative census takers on the ground—

Cause of Mortality	Number of Cases Reported						Totals
	Alberta	Sask	Man.	N. Dak.	S. Dak.	Minn.	
Natural enemies	89	80	39	86	25	84	403
Drying up of water	41	69	10	40	37	18	215
Mowing, plowing, grazing . . .	20	27	3	16	20	35	121
Flooding	2	..	15	1	..	10	28
Fire	6	5	2	4	..	..	17
Disease	5	..	1	2	3	1	12
Illegal shooting and taking of eggs	5	1	2	1	..	1	10
Hail	5	..	3	..	..	..	8
Miscellaneous	3	1	1	5	2	8	20
	176	183	76	155	87	157	834

Recommendations for Improvement of Conditions. A digest of the numerous recommendations which have been made by field observers in their reports shows a number of constructive activities which, in their opinion, would greatly improve duck breeding conditions in their localities. Control of natural enemies, particularly the crow, was the most frequent recommendation of all suggestions made. The building of dams and dikes for the purpose of impounding water and maintaining water levels appears next in order of importance. The following table reflects the summary of 383 reports on this subject—

Action Recommended	Number of Times Recommended
Control of natural enemies	214
Water Conservation (building of dams, etc.)	126
Increase of waterfowl foods (by planting, control of carp, etc.) ..	107
Salvaging young ducks from drying areas.....	38
Restrictions on shooting	17
Miscellaneous	21

The consensus of opinions of local field observers clearly shows that there is a large and fruitful field for constructive work in improving duck breeding conditions, reducing losses, and increasing the annual supply of young ducks. Of greatest interest is the fact that game officials, farmers, and sportsmen in Canada would cooperate whole-heartedly in a constructive program if given encouragement—which obviously must come from the United States.



FIG. 54 (Map 1)—Low Water Breeds Duck Disease: The alkali-encrusted remnant of a drought-stricken North Dakota lake.

IX

METHODS USED IN DETERMINING TOTAL DUCK POPULATIONS

To arrive at the duck population of a large territory (such as a state) during the breeding season, it is not necessary to canvas every acre of water and marsh. Complete coverage is desirable but not feasible. For practical purposes, the total can be arrived at by censusing (1) the most important breeding places and (2) one or more "sample" units within districts of uniform character. In the latter case, basic figures may be arrived at and applied in computing the duck population of the districts.

Let us take Minnesota, for example, and quote from the report of Mr. Grange. On the basis of the state's varied topography, differences in the distribution of its 2,368,480 acres of water, and differences in the character of the water areas, this state was divided into eight districts in which natural characteristics influencing duck breeding conditions are about uniform. The widely varying types of terrain are revealed in the description of Census Districts 1 and 2—

"District No. 1, the western prairie belt, including six entire counties and portions of two others, totalling 7,157 square miles, is primarily a well-developed agricultural region, principally devoted to wheat. It originally contained 88 lakes, totalling 15,736 acres, but prior to 1928, 47 of these lakes were dry. The 1928 dry acreage is not available, but it constituted probably 75 per cent. Drying out since 1928 has also been extreme with recovery of the water level in 1935 very slow.

"District No. 2, level wet marsh region, including five entire counties and portions of four others, totals 9,769 square miles. The ground is often peaty, and much of it crossed by drainage ditches. In general, the region is wooded, largely with aspen and second growth, but there are extensive areas of used agricultural land as well. There are relatively few lakes in this region, but Upper and Lower Red Lakes give it a large water acreage. A total of 108 meandered lakes, comprising 50,276 acres, of which two, totalling only 779 acres, were dry in 1928, is listed in the official gazetteer of lakes for Minnesota. There are, however, many small water areas below meander size, which are not listed. Drought since 1928 has been severe, but the recovery of water levels in 1935 has been encouraging."

Other regional divisions of Minnesota for census purposes, each division having its own peculiar characteristics, were: The Arrowhead Canoe country, the Northern Lakes Region, the Central Lakes counties, the Intermediate, South-eastern, and Southern areas.

"While these districts are somewhat arbitrarily determined, they do, nevertheless, work out satisfactorily in actual census practice," Mr. Grange found. "It is possible to generalize and draw conclusions for each district separately which would at most be vague or ambiguous if treated less specifically.

"Where certain areas could not be thoroughly censused, as was often the case in some of the larger and better watered counties, typical samples have been used, and the results, with the aid of maps and careful study of the type of country, applied to the uncensused portions. A thorough census of one township, for example, provides a working figure for application to surrounding townships of approximately the same water area, and general cover type. Much here admittedly depends upon the judgment of the tabulator, yet it is felt that the results obtained are really more accurate than could be anticipated. In several instances where appraisals had been made on the basis of the sampling method, census reports on the areas came in later. The final figures were usually remarkably close. However, it is necessary to limit application of sampling figures to comparable types



FIG. 55 (Map 1)—A Type of Minnesota Duck Nesting Country Frequented by Mallard and Teal: The Mississippi River in Cass County.

of environment: For example, it is not possible accurately to convert a prairie county figure to use in the northern wooded lakes region. Yet it soon becomes obvious that the production limits of the several Minnesota duck environments are about the same over wide regions, a fact which makes censusing by the sampling method perfectly practical and satisfactorily accurate.

"The species percentages are believed to be quite accurate for the more common species. It is true, however, that some of the less common and, therefore, less readily identified species were no doubt often listed as unidentified, and proportionately in larger numbers than were mallards and blue-winged teal. Species percentages were secured by figuring from the actual counts only, or from very careful numerical estimates, and the unidentified column was omitted in this figure. This is perhaps not strictly accurate, but the method was standard throughout

so that percentages are comparable. Percentages are approximate only, and no doubt vary greatly in accuracy. On the whole, however, it is little short of startling to find how closely the independent observations from contiguous counties of the same type coincide—indicating that the figures must actually have a definite field basis.

"As to numerical estimating by cooperators," states Mr. Grange, "their figures proved extremely interesting. One very competent field man insisted that all the estimates are ridiculously high, and contends that no duck country in Minnesota is producing even 15 or 16 ducks per square mile over an area as large as a county. Other observers sent in reports which figured out to in excess of 200 ducks per square mile for entire blocks of counties. Obviously, discretion must be used in such cases, and wherever the estimates have appeared to be at variance with those reported for similar areas on the basis of careful work, special treatment has been given. If the actual count is available for the area in question, it has been used after reducing to a square mile or township basis.



FIG. 56 (Map 1)—A Minnesota Resort of Surface-Feeding Ducks: Blue-winged teal on Cameron Lake, Polk County.

"If no actual counts are available, information has been sought from other cooperators, and the estimates averaged. Even then, if the resulting figure has been too seriously out of line, in the opinion of the tabulator, the whole group has been set aside and the district average substituted. Admittedly then there is a 'personal equation' in the figures, not only that resulting from the census work of many different individuals, but as respects compilation and interpretation. I accept full responsibility for the tabulation, and can only state that it represents a sincere, painstaking, and often arduous attempt to secure accuracy. I, personally, am more confident of the accuracy and am better pleased with the whole census than I had expected. In my judgment, the tabulation is very close to correct. If it errs, then the error itself should be constant, and the relative significance of the data secured is not affected."

The foregoing adequately describes the basic situation and line of procedure in the other states and the southern portions of the provinces where

the key men in charge of census taking encountered practically the same problems and solved them in a similar manner. The line of procedure differed, but essentially the work was identical. In the provinces, for instance, duck populations were figured separately for areas represented by three-mile topographic maps. Lake and marsh acreage was totalled, allowance was made for drying up of water shown on the maps, and after careful study of the terrain and reports at hand basic figures were established for computing the duck populations on lakes, marshes, running streams, and other environments. Small sloughs and potholes which are not mapped were also taken into account. Often it was necessary to establish more than one basic figure to reflect the conditions of lakes on the same map wherever they varied with the character of the country.



FIG. 57 (Map 4)—Some Good Looking Lakes May Have Sparse Duck Populations: The light-colored masses bordering this rushy shoreline of Island Lake, Alberta, appeared to be water lily pads. Where this aquatic grew, ducks were not plentiful.

In northern areas covered by airplane, there were fewer difficulties in arriving at basic figures applicable to areas not surveyed. The work there had a much wider basis. A very large percentage of the water areas was actually covered, and there were few variations in the character of the country. For example, the waters in the Canadian Shield, as has been pointed out (page 32), are, with some exceptions, uniform in character. If investigations of several widely scattered sample areas within the Shield produce almost identical figures, it is unnecessary to investigate all of the innumerable surface waters for the purpose of arriving at accurate totals for the entire area. The law of averages will apply if the figures reflect basic conditions. But, of course, exceptions, such as conspicuously good breeding places in river deltas, have to be detected and appraised separately.



FIG. 58 (Map 5)—An Excellent Nesting Area: The mixed wooded, muddy and marshy eastern portion of Richardson Lake, Alberta.

Correlating Aerial and Ground Observations

In some instances it was possible to correlate observations from airplanes with those of investigators on the ground. As an example, we give a brief description of the area shown on Map 3 as seen from the air, and the findings of cooperative investigators of the same area on the ground. The following continues the description on pages 23-31 of the route flown, where we left off at a group of unnamed lakes west of Thunderchild Indian Reservation—

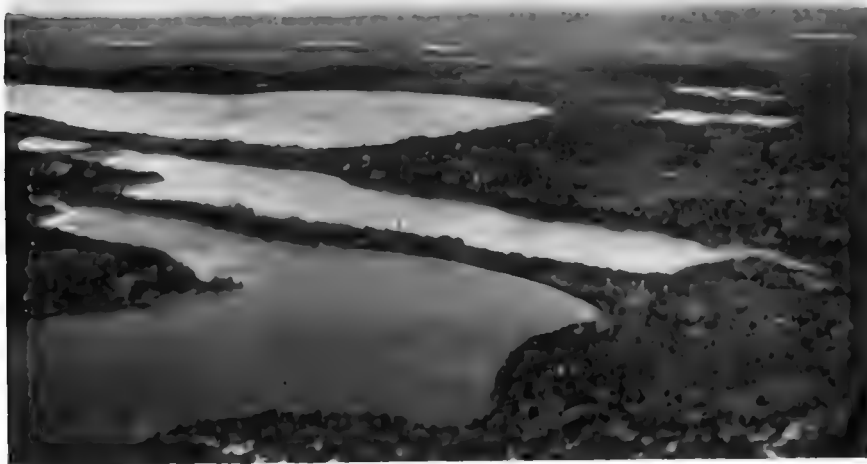


FIG. 59 (Map 5)—A Distinctly Different Type of Terrain in Close Proximity to That Shown Above: Ponds in the thinly timbered sand country south of Richardson Lake which were barren of ducks.

We are now leaving a generally heavily-timbered area for more open country, in which the number of grain fields increases to the exclusion of wooded tracts. In this country, we come first to a small lake of shallow appearance from which about 500 mallard ducks rise upon our approach. We proceed to Spruce Lake with its clear, greenish blue, apparently deep water. There is still some timber here at a distance from the shores. The lake apparently is used as a summer resort. No ducks are visible except about 400 surface-feeders in an area barren of marsh vegetation, located at the northwestern end of the lake.

We climb for altitude again. Imhoff's Lake gives a poor impression—stony shores fringed by trees—yet there are about 500 ducks on the water. Bolney Lake, which is much larger, has partly stony shores

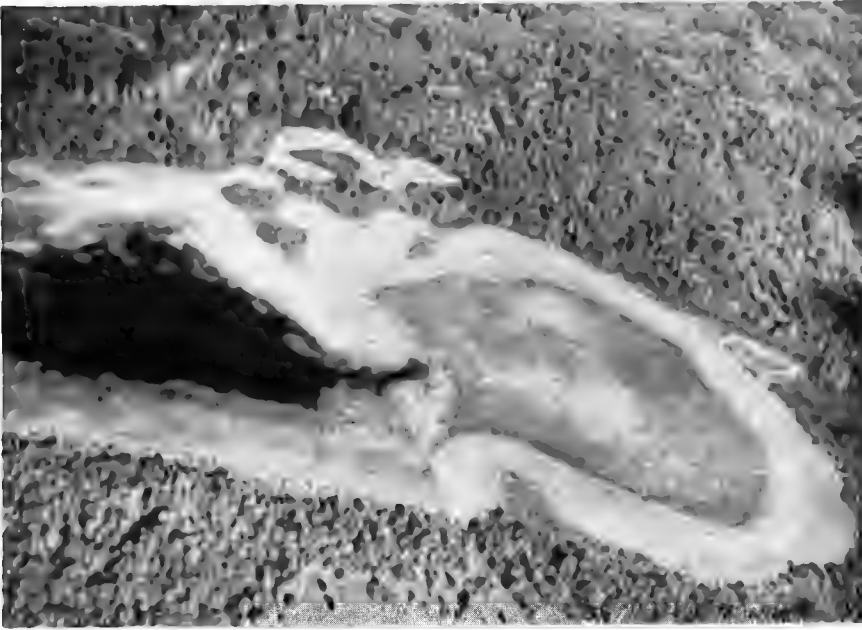


FIG. 60 (Map 2)—Progressive Cutting of Moisture-Retaining Vegetation Speeds Up Evaporation: The light-colored swath of the mowing machine is plainly discernible. Soon this pond bottom will be entirely dry.

barren of marsh plants. Other portions were well fringed with bulrushes and at least 1,000 ducks are visible on the water from an altitude of 1,000 feet.

The next, an unnamed long lake with shores partly stony, partly sandy and crowded in by trees, has no marsh vegetation. On its greenish blue, deep water, few birds are visible.

Two unnamed lakes follow, connected by a splendid marshy area of dense bulrushes. Here at least 10 ducks per acre of water and marsh are estimated—a total of 3,000. The western shore of the western lake is sandy.

From here on, the country becomes densely timbered again. Only a few scattered fields appear. About two miles southeast of Sidney

Lake, in this timbered country, we observe a settler mowing marsh plants for hay on a portion of a marshy pond. Fig. 60 indicates how such activities contribute toward the drying up of surface waters.

Here is what the cooperators on the ground in this area reported in their individual townships—

The first township reported on was entered at Spruce Lake during the flight. On this township (T. 53, R. 22), P. Fuchs, farmer, of St. Walburg, gives a total count of 2,111 ducks with an additional estimate of 150. On his plat (reproduced in reduced form on Sheet B) he shows us how they are distributed over the township. On the corner of Spruce Lake located in his township, he shows 217 ducks, while we have observed 400 from the air here and on the adjacent area outside the township. He gives a total count of 981 ducks on the Englishman River which appeared quite inconspicuous from the air at the point of crossing. On Imhoff's Lake he counted 478 ducks, as compared with 500 estimated from above.

The report of V. L. Daily, merchant, of Paradise Hill, for Township 52, Range 23, shows 600 ducks for Bolney Lake, compared with at least 1,000 seen from the air. While few birds were noted from the air on the next long unnamed lake, Mr. Daily reported 200 for the portion of it located within the township. John Leer, farmer, of St. Walburg, points to another 200 on the remainder of the lake in his township (T. 53, R. 23). The latter's report gives no figures for several water areas shown on the map, including the lakes along its western border. A portion of these extends into the next township in the west (T. 53, R. 24), which is covered in Mr. Daily's next report by a figure of 600, while the estimate from the air for the entire area is 3,000. It may be noted that this report shows the location of a number of small well-populated waters in the southern portion of the township which are not shown on the topographic maps.

In the next township reported on (T. 54, R. 24), N. Fuchs, farmer, of Red Cross, shows the presence of a small duck population which was not apparent from the air. The township adjoining it on the north (T. 55, R. 24) and the one on the east of the latter (T. 55, R. 23) extend into the Bronson Provincial Forest. They were off the line of flight, but the reports of F. J. Arnold, fire ranger and farmer, of Red Cross, and E. J. Smith, farmer and trapper, of St. Walburg, furnish a good picture of the character of this timbered country and its duck population.

These are examples of the care with which ground investigations have been carried out by volunteer cooperators, bringing out the existence of many small areas not mapped and providing very helpful information for census purposes. Reproductions of the reports and plats filed by the above-named investigators are shown on Sheets B and A. You may study their figures, opinions, and the plats they have drawn and compare the latter with Topographic Map 3 for accuracy. Other reports, covering adjoining townships, are just as interesting but they cannot be shown for lack of space.

X

CONCLUSIONS

In the light of experiences gained during the 1935 International Wild Duck Census, it is entirely practical to take censuses of ducks on their breeding grounds, to arrive at surprisingly accurate figures on duck populations, and, with proper organization of local residents, to obtain also most comprehensive information on the checks to increase during the nesting and growing seasons. Without a proper appraisal of the annual waterfowl "crop" there can be no proper appraisal of the annual harvest by hunting to be permitted. Without first-hand knowledge of those factors destructive to eggs and ducklings, little information on which to base corrective measures would be available. Authentic knowledge of both the available supply and of checks to increase is essential to a business-like management of our wildlife resources.

Proper preparation, well before the initiation of field work, is advisable and necessary for the proper coordination and speedy completion of a census of any breeding area—whether it is to be an inventory of a county, state, province, or of a major section of the continent. By proper preparation is meant: Thorough study of the areas prior to the census by those to be in charge of the work, so that they may become thoroughly acquainted with the terrain and the characteristics of various sections.

Natural characteristics of one type of country invariably distinguish it from another. For instance, a flat prairie country, dotted with small potholes of up to 25 acres or so with still, shallow water, muddy bottoms and lush vegetation, naturally delimits itself from a country of heavily timbered uplands with fast-flowing streams, deep and clear rock-bottomed lakes, and but few desirable waterfowl food plants.

The various types of nesting territories should be grouped into districts, each district having approximately its own individual natural characteristics, as distinguished from another. Then, in the event complete census coverage of the entire district cannot be obtained, sample areas can be minutely covered and accurately rechecked. Analyses of the sample areas will be found to quite accurately reflect the total duck population, the checks to increase, and other desired data of an entire district of the same general type.

Organization of cooperating local groups, distribution of full information on the purpose of the census, along with an adequate supply of printed questionnaires and tally sheets, should be completed well in advance of the contemplated census. The selection of chairmen who have full knowledge of their local territories is important. The procedure followed in the organization of local census groups, described in Chapter III, might well be patterned after.

Essential facts which a properly conducted annual census should reveal follow:

1. Distribution of waterfowl by numbers.
2. Distribution by species.
3. Density per unit, square mile, or township.
4. Basic figures as to number of ducks per acre of water surface, per ditch mile, stream mile, beaver flowage, pothole, etc.
5. Absentees.
6. Newcomers to the areas.
7. Stragglers.
8. Relative proportion of sexes—by species.
9. Size of broods, with age of ducklings, whenever possible, to ascertain early and late nesters.
10. Number of birds not nesting.
11. Second nesters.
12. Main hatching periods of various species.
13. Attempted but unsuccessful nestings.
14. Loss or gain on the breeding grounds (as compared with the preceding year).
15. Cause of losses.
16. Adverse and beneficial local factors during the current breeding season.

Experiences gained in the First International Wild Duck Census make possible the following suggestions as to field procedure in future endeavors of this kind.

GROUND WORK

1. Accuracy in obtaining field data is more important and more valuable in census work than guesswork based on estimates. A small number of exact field reports are more useful than a large number of returns based on opinions. Repeat counts wherever possible.
2. Early morning and late afternoon hours appear to be the best for census-taking purposes. Field investigators should endeavor to approach waters and marshes from the lee side, wherever possible, with the sun behind them.
3. Wherever it is not practicable to obtain thorough coverage of important breeding places, adequate provisions must be made for exact surveys of sample tracts typically representative of the whole area.
4. Large marshy areas, lakes and streams with dense growths of marsh vegetation along the banks can be conveniently surveyed with floating blinds of simple construction. Here is a brief description of a device used this year in obtaining a partial coverage of the marshes at the southern end of Lake Manitoba: Two canoes were joined by 2 x 2 cross pieces. Bicycle tape was used in fastening the cross pieces to canoe struts. The canoes were joined so that they were about one foot apart at the center—providing ample space for one or two paddlers working from the rear seats to paddle between the canoes. On the butts of the laterals extending beyond the gunwales, six-inch pliable boards and a few uprights were nailed. On this outer framework, two-inch-mesh poultry wire (a larger mesh is still more suitable) was fastened. Freshly



FIG. 61—Building a Floating Blind for a New Kind of Duck Hunting: Space was provided between the canoes to permit use of paddles by census takers.

cut bulrushes and cat-tails were woven into the chicken wire, the bottom of the screen barely touching the water surface after floating the blind. (The screen should not impede moving the blind



FIG. 62—The Blind After Launching With Five Field Workers: The bottom of the grass screen is just above the water surface and thus does not create a wake which might alarm the birds.

about.) This blind proved effective in that it thoroughly concealed the observers and made it possible to get within a few feet of ducks without disturbing them, thus permitting very interesting observations of young and old ducks feeding, etc. Fig. 61 shows the blind under construction and Fig. 62 shows the blind after launching with five observers, one of whom may be discerned standing.

5. The best time to make surveys on the ground is directly after the birds settle down for breeding (in the agricultural part of the prairie duck breeding grounds, at the end of June)—to establish the numerical status of mature birds by species, relative proportion of sexes, and brood counts of early nesters. Repeat the second week in August with special attention to brood counts of late nesting species.
6. Field investigators should keep a tab on adverse and helpful factors during the breeding season—such as weather conditions, water levels, fires, and so forth, which have a decided effect on local duck breeding conditions. Such facts may be very helpful to those in charge of census work when they interpret and tabulate the findings of the field workers.
7. The compiler of the returns (the key man in charge) should have ample opportunities to make independent surveys.
8. The compiler should have an office assistant in charge of the organization work, to arrange for proper supervision and checks on certain selected areas.
9. Repeat counts on the same tracts year after year—to reveal changes, if any.

SURVEYS FROM THE AIR

1. Cabin planes which permit of good visibility all around are far superior to open cockpit machines for this work.
2. Best height for observations is about two hundred feet.
3. Satisfactory observations are not possible at desirable altitudes at speeds in excess of 75 miles per hour. The best observation speed is the slowest safe speed of which the plane is capable.
4. Pay special attention to the lee sides of areas investigated.
5. Try to get the sun behind you.
6. Whenever possible photographs should be taken approaching or going away from the scene being photographed, unobstructed by wings, struts or others parts of the plane. Oblique photography through the floor of the plane, such as used in aerial map making, is probably best. This was not feasible this year because the planes used were not so equipped.
7. Best time for ascertaining total duck populations from the air is the second half of August (earlier investigations may result in missing young broods of late nesting species).
8. Arrangements should be made for dropping ground observers for a few days' work in each of several vicinities in the northern breeding grounds for the purpose of obtaining total number of old birds, proportion of sexes, relative abundance of species, brood counts, and so forth (same as in ground work) during the first few days in July.

* * *

States, sportsmen's organizations, bird clubs, etc., may conduct surveys "on their own" and with the aid of the above hints keep a tab on total numbers of duck populations, densities, losses on the breeding grounds, crops, breeding conditions, status of water levels, etc. The census this year proved there is a widespread interest in this type of work which cannot help but have very beneficial results in the cause of conservation. If repeated year after year, census takers will gain experience and each year the facts as they exist will be reflected more accurately in their returns. Facts are needed for the proper management of our waterfowl. Unless such management is undertaken, no permanent increase in the supply may be looked for.

This year's work simply broke the ground. There is still much to be done in this field to complete the picture—not only on the prairie duck breeding grounds but in other breeding areas which could not be included in the survey this year. Areas which should also be considered important are British Columbia, and a number of other middle western and northwestern states. In addition, the main black duck breeding range in eastern Canada and the eastern states should be carefully explored. This year, the aerial survey reached only about halfway up the western breeding range of ducks which extends to the McKenzie River delta. Important Alaskan breeding grounds also should be covered by an aerial survey.

As has been conclusively shown elsewhere in this publication, there is a widespread public interest in work of this kind, numerous cooperators volunteering and accomplishing the work at their own expense. This was true on both sides of the International boundary line.

Surely such a helpful general interest should be maintained and used constructively in the assembling of information essential to the maintenance of our valuable waterfowl resources and in the accomplishment of corrective measures which their findings indicate to be necessary. Thousands of sincerely interested people are anxious and glad to cooperate in practical field work if proper direction is given them. This fact was not the least of the many encouraging results uncovered in the hitherto unexplored field into which the First International Wild Duck Census was launched.

* * *

On the continent as a whole there probably were sixty-five million ducks during August, 1935. This is merely a rough estimate which, if correct, indicates that the total number of ducks is far from satisfactory—and much below what we should have. At least twice as many ducks are needed if we are to regard the duck situation with comfort. With proper management we might have them within the short period of two or three years.

¶ MORE GAME BIRDS IN AMERICA—A Foundation, is a non-profit organization, national in scope, sponsored by some of the leading business men in the United States. These men are giving liberally of their time and money in an endeavor to work out a satisfactory solution of our game bird problem.

¶ The founders are appalled at the economic waste which has resulted from the depletion of one of our great natural resources—game birds. They believe that a substantial and permanent increase in game birds in this country can be obtained by applying sound business methods to this problem and by learning from the experience of other countries which have been faced with an identical problem and solved it satisfactorily. This will create, and assure for the future, greater opportunities for recreation, sport, and enjoyment of the great outdoors; a new and great industry supporting thousands; an increase in rural land value; and a new source of income for our farmers.

¶ MORE GAME BIRDS IN AMERICA solicits the assistance and cooperation of individuals and organizations interested in its sole objective—an increase in the number of game birds in America.

COOPERATORS

1935 INTERNATIONAL WILD DUCK CENSUS

In grateful recognition of the work of the many volunteer cooperators who have taken a conspicuous part in the 1935 International Wild Duck Census, in addition to those mentioned in the report, the following list is published. It was these men—farmers, sportsmen, state and provincial officials, and others in nearly every walk of life—who made possible the collecting of the valuable data contained in this report. To them we extend our sincere appreciation.

MORE GAME BIRDS IN AMERICA, Inc.—A Foundation

ALBERTA

Allen, J., South Edmonton	DeLong, G. E., Lacombe	Irwin, J. L., Edmonton
Allred, F. F., Twin Butte	Dempsey, G., Hay Camp	Jameson, P., Alix
Anderson, A. R., Notikewin	Derby, Rev. J. W., Hanna	Jennings, H. J., Foremost
Angell, H. G., Bassano	Deschamps, J. B., Standard	Johnson, E. E., Duhamel
Annable, W. M., Red Deer	Dodd, A. J., Innisfail	Johnson, T. R., Lindbergh
Antonink, R. M., Smoky Lake	Dodd, E. J., Innisfail	Jones, W. A., Battle Lake
Aspinall, A., Innisfail	Doucette, M., White Court	Kahut, S., Hay Lakes
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Bailey, M., Pincher Creek	Duffy, H. J., Vilna	Kelly, J., Ponoka
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Bakus, G., Wetaskiwin	Edwards, E. R., Edmonton	Kovach, J., Beaver Mines
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 Heidebrecht, C., Rush Lake
 Henderks, H., LeRoy
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 Holmes, M., R. M. No. 7
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 Howes, W. H., Kindersley
 Howey, W. E., Lake Johnston
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 Hull, E., Stoughton
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 Irwin, Mr., Kipling
 Jepson, E. J., Prince Albert
 Joel, J., Elbow
 Johnson, A., Glidden
 Johnston, J. T., Moosomin
 Johnstone, Dr. R. M., Vidora
 Kains, E., Markinch
 Kine, M. H., Macklin
 Kitching, J. G., Winter
 Knaus, J., LeRoy
 Knudsen, P., Shamrock
 Krepps, G., Brock
 Kuntzie, W., Climax
 Kurulak, N., Candora
 Kushnir, M. F., Wroxton
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 Lambs, B., Grenfell
 Larson, J., Lake Alma
 Larson, J. A., Swift Current
 Lawson, J. G., R. M. No. 287
 Lazaroff, N. W., Verigin
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 Leggett, W., Markinch
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 Loucks, H. A., Invermay
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 Matai, F., Touchwood
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 McLntyre, R., Wapella
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 McKee, T., Parkbeg
 McManus, J. H., Colgate
 McNaught, R., Climax
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 Mills, R., Moosomin
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 Moore, E. A., Herschel
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 Morrison, S. J., Earl Grey
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 Mosly, A. L., Montmartre
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 Mullen, W., Brock
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 Olson, P. J., Sisseton
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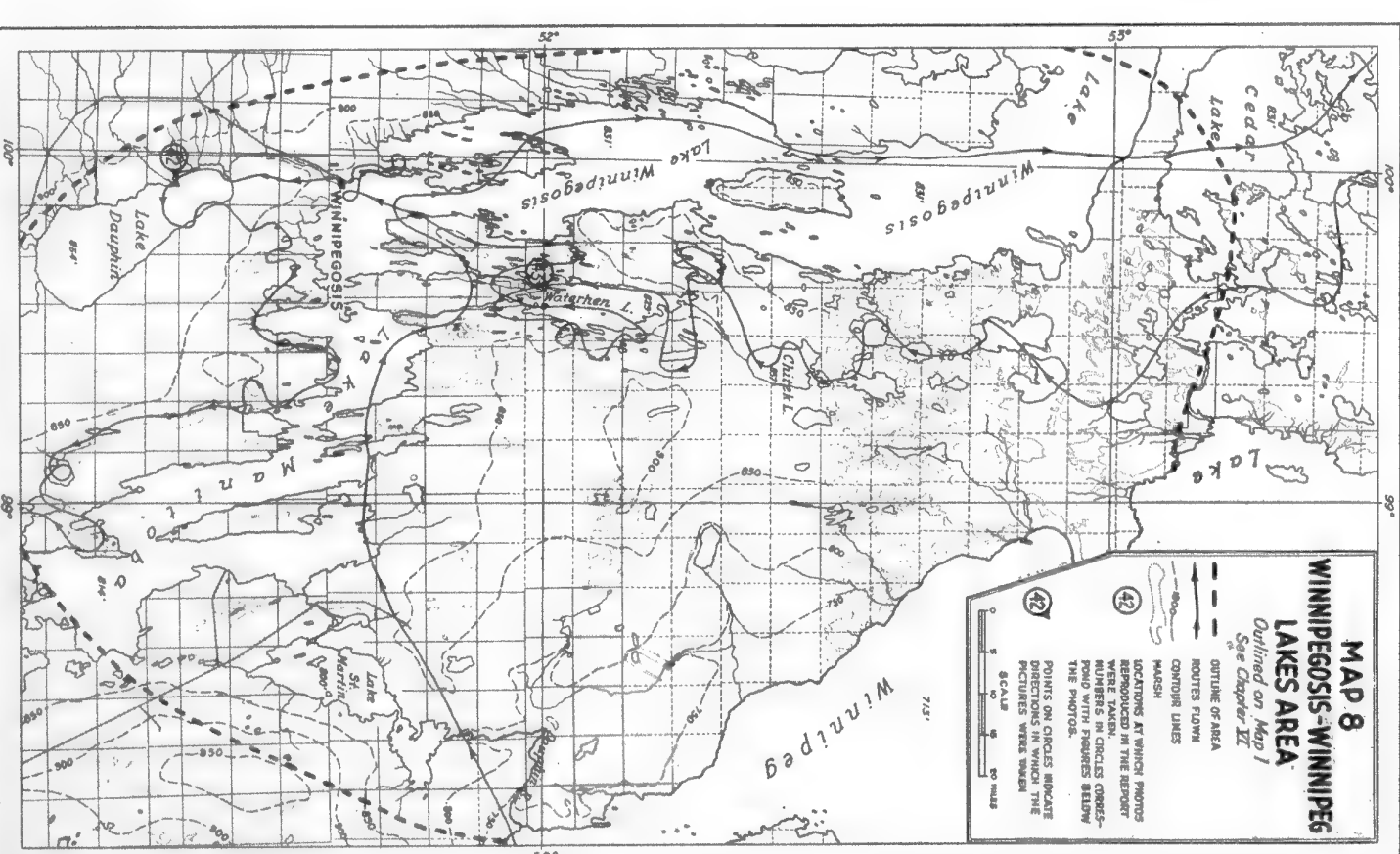
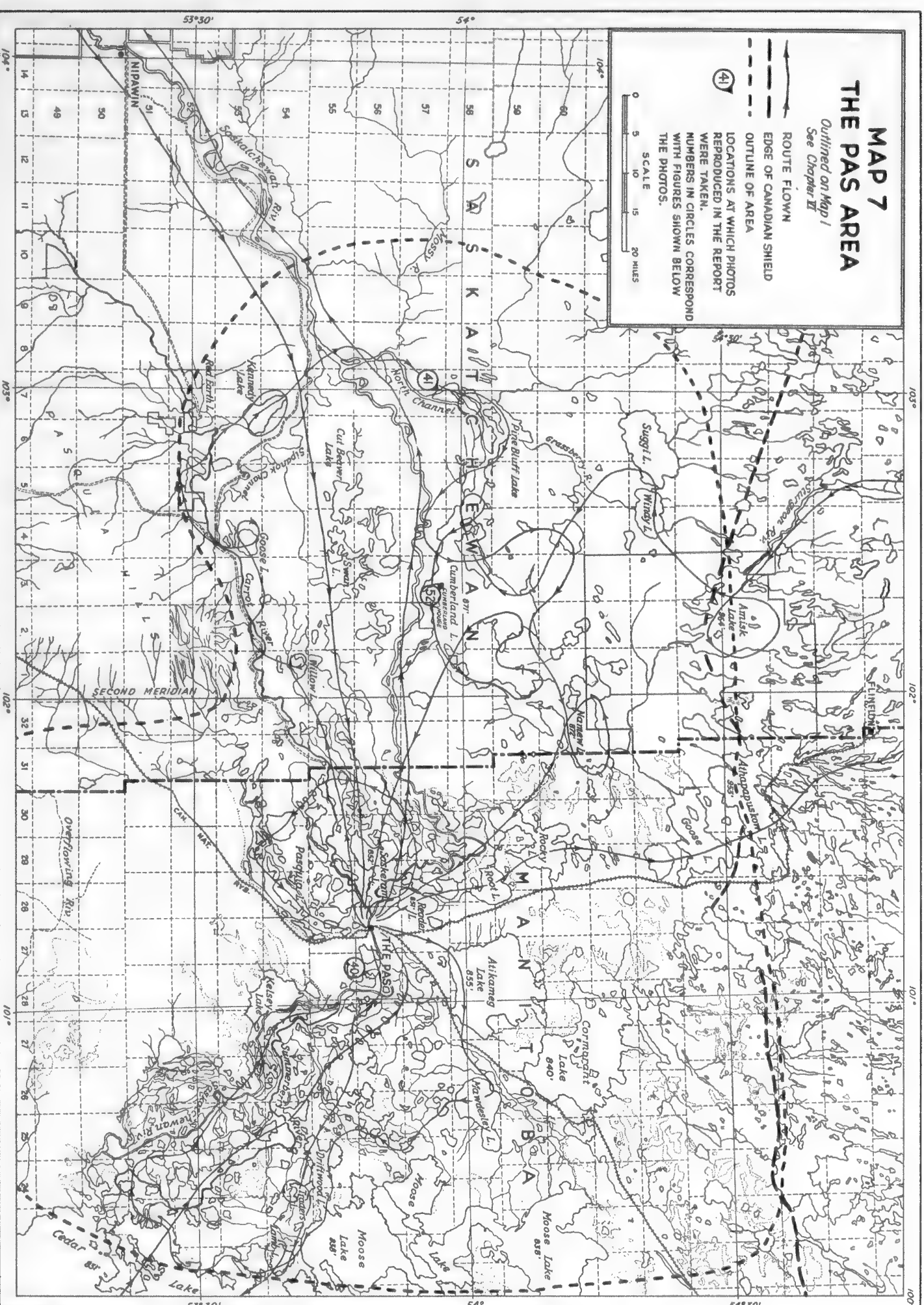
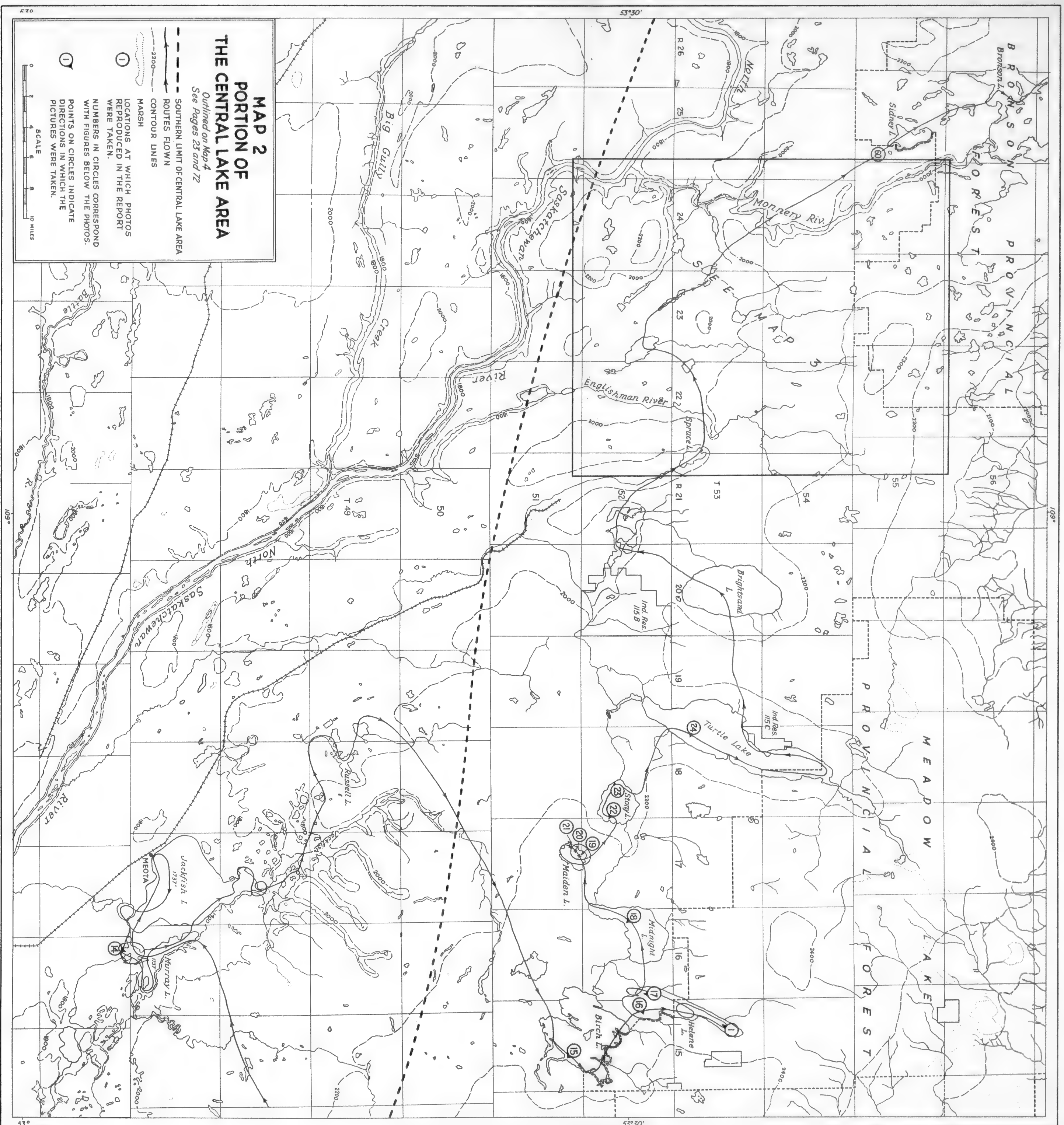
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 Renter, L. H., Palisade
 Richards, J. C., Big Falls
 Rinowski, J. J., Greenbush
 Rohards, H. B., Alexandria
 Roberson, B., Park Rapids
 Roberts, W., Butternut
 Robertson, C. M., Jackson
 Rockel, E. O., Cohasset
 Roscoe, L., Pipestone
 Rosenberg, O. H., Nevis
 Rudser, S., Deer River
 Rue, L. W., Lakefield
 Sakry, C. R., Bemidji
 Sather, E. W., Glenwood
 Schiel, E. F., Brainerd
 Schleppegrell, V. L., Littlefork
 Schluter, E. F., Sedan
 Schmechel, W., Warroad
 Schoberg, A., Rush City
 Schramm, F. W., Gaylord
 Schroeder, F., Paynesville
 Schulte, L., Montevideo
 Schultz, F., Warroad
 Schutz, A. H., Waconia
 Seemann, G., Gaylord
 Sell, A. P., Hillman
 Shafer, H. N., Lake Crystal
 Shanatt, E. M., Sebeka
 Shea, O., Blackduck
 Silcher, L., Isanti
 Simons, R. S., Chicago, Ill.
 Simonson, N. A., Hanley Falls
 Smith, C., Park Rapids

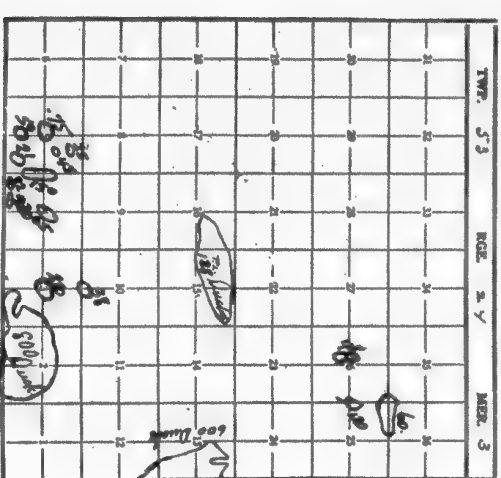
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 Smith, L. E., Bena
 Smith, R. E., Worthington
 Smith, W. H., Cass Lake
 Sontag, D., Heron Lake
 Sovick, S., Fosston
 Stadheim, I., Albert Lea
 Staples, H., Lengby
 Statler, H. E., Duluth
 Stevenson, J., Morris
 Stoudt, J. H., Ely
 Streich, F., Villard
 Streich, R., Moorhead
 Swanson, M. A., Glenwood
 Swanson, R. R., Bronson
 Swedberg, A., Malmo
 Sweeney, J. V., Mahanomen
 Synstiby, O., Hanska
 Taylor, C. E., Aitkin
 Taylor, E. A., Faribault
 Testin, E., Palisade
 Thorstensen, E., Red Wing
 Toop, A., Hancock
 Toop, F., Morris
 Toutloff, F., Ely
 Trainer, S., Lake Ballantine
 Trent, G. E., Brainerd
 Trontow, E., Morris
 Turnbull, Dr. J., Karlstad
 Tweet, L., Redwood Falls
 Velta, A. O., Canby
 Venning, F. A., Chisholm
 Voinbrock, J., Melrose
 Wacker, E., Willmar
 Wanner, Dr. E., Willmar
 Warner, S., Hutchinson
 Wassen, J., Crosby
 Watters, J. O., Alexandria
 Watts, E. J., Crosby
 Wente, W., Hancock
 Wesley, J., Garrison
 Westerdahl, Dr. F. R., Willmar
 Whitney, R. R., Montevideo
 Widdowson, M. C., Hillman
 Wiekland, H. M., Marshall
 Williams, J., Deer River
 Wilson, D., Hill City
 Wilson, J., Remer
 Wolf, W. L., Naytahwaush
 Wright, H. K., Cass Lake
 Wynne, H., Fosston
 Yale, R. P., Cannon Falls
 Zaurhe, W. F., Baudette



Page 3
Tally Sheet Number 3
Date of Observation Aug 10 1935 Time of Observation 5:10 PM
SASKATCHEWAN
INTERNATIONAL WILD DUCK CENSUS, 1935
Range 24
Area Reported on—Township 53
Range 23

Species	Count	Remarks
Male	1080	223 1498
Female	87	522 175 714
Young	8	32 10 50
Pin	18	399 90 537
Quail	1	8

TOTAL: 1998 2033 506 9637
IMPORTANT—SEE OTHER SIDE OF



1. If it was not possible to locate all ducks on the area reported on, give approximate number of ducks that should be added to the total noted on the other side of this sheet to make up the total duck population.
Old: 1 Young: 1

2. How do the number of male ducks compare approximately with the number of females?
Old: 1 Young: 1

3. What are the chief causes of losses of ducks and nests in the area covered in this report? State whether natural enemies such as crows, owls, hawks, gulls, cats, foxes, coyotes, turtles, etc.; grazing, fire, disease, drying up of water, mowing, etc.

4. What is the important duck breeding place covered in your report and can be improved by building dams or dikes?
None

5. What are any places in your vicinity in which large numbers of ducks breed in former years which could be renewed?
None

6. What are your recommendations for improving duck breeding conditions in the area reported on, such as: Controlling natural enemies, cleaning up diseased places, salvaging young ducks from places which dry up or increasing natural food?
Building 76 dams.

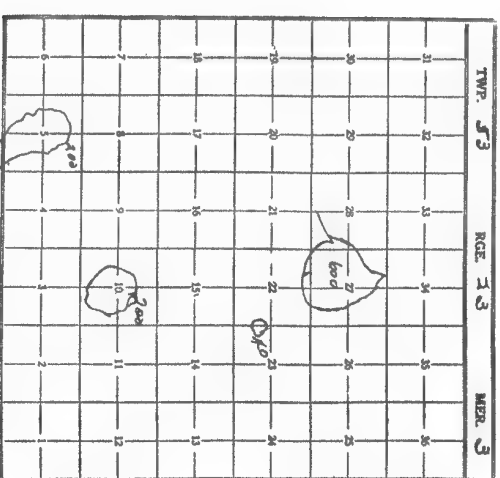
IMPORTANT
Please return this Tally Sheet with May attached to your Municipal Secretary not later than Sunday, August 11.

Name of Investigator: L. P. Dault
Occupation: Merchant
P. O. Address: Paradise Hill, Sask.
Are you a duck hunter? Yes

Page 3
Tally Sheet Number 2
Date of Observation Aug 11 1935 Time of Observation 5:11 PM
SASKATCHEWAN
INTERNATIONAL WILD DUCK CENSUS, 1935
Range 23
Area Reported on—Township 53

Species	Count	Remarks
Male	60	400 40 500
Female	30	145 20 175
Young	40	140 18 198
Quail	1	167 167

TOTAL: 130 665 245 1040
IMPORTANT—SEE OTHER SIDE OF



1. If it was not possible to locate all ducks on the area reported on, give approximate number of ducks that should be added to the total noted on the other side of this sheet to make up the total duck population.
Old: 1 Young: 1

2. How do the number of male ducks compare approximately with the number of females?
Old: 1 Young: 1

3. What are the chief causes of losses of ducks and nests in the area covered in this report? State whether natural enemies such as crows, owls, hawks, gulls, cats, foxes, coyotes, turtles, etc.; grazing, fire, disease, drying up of water, mowing, etc.

4. What is the important duck breeding place covered in your report and can be improved by building dams or dikes?
None

5. What are any places in your vicinity in which large numbers of ducks breed in former years which could be renewed?
None

6. What are your recommendations for improving duck breeding conditions in the area reported on, such as: Controlling natural enemies, cleaning up diseased places, salvaging young ducks from places which dry up or increasing natural food?
Build 100 dams.

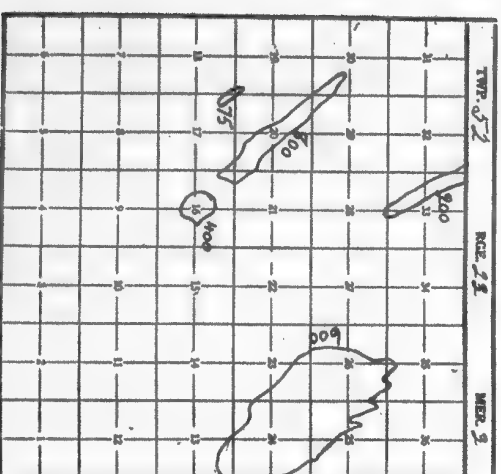
IMPORTANT
Please return this Tally Sheet with May attached to your Municipal Secretary not later than Sunday, August 11.

Name of Investigator: John Lee
Occupation: Farmer
P. O. Address: Arcturion, Sask.
Are you a duck hunter? Yes

Page 3
Tally Sheet Number 4
Date of Observation Aug 25 1935 Time of Observation 3:30 PM
SASKATCHEWAN
INTERNATIONAL WILD DUCK CENSUS, 1935
Range 23
Area Reported on—Township 53

Species	Count	Remarks
Male	1080	223 1498
Female	87	522 175 714
Young	8	32 10 50
Pin	18	399 90 537
Quail	1	8

TOTAL: 1998 2033 506 9637
IMPORTANT—SEE OTHER SIDE OF



1. If it was not possible to locate all ducks on the area reported on, give approximate number of ducks that should be added to the total noted on the other side of this sheet to make up the total duck population.
Old: 1 Young: 1

2. How do the number of male ducks compare approximately with the number of females?
Old: 1 Young: 1

3. What are the chief causes of losses of ducks and nests in the area covered in this report? State whether natural enemies such as crows, owls, hawks, gulls, cats, foxes, coyotes, turtles, etc.; grazing, fire, disease, drying up of water, mowing, etc.

4. What is the important duck breeding place covered in your report and can be improved by building dams or dikes?
None

5. What are any places in your vicinity in which large numbers of ducks breed in former years which could be renewed?
None

6. What are your recommendations for improving duck breeding conditions in the area reported on, such as: Controlling natural enemies, cleaning up diseased places, salvaging young ducks from places which dry up or increasing natural food?
Build 100 dams.

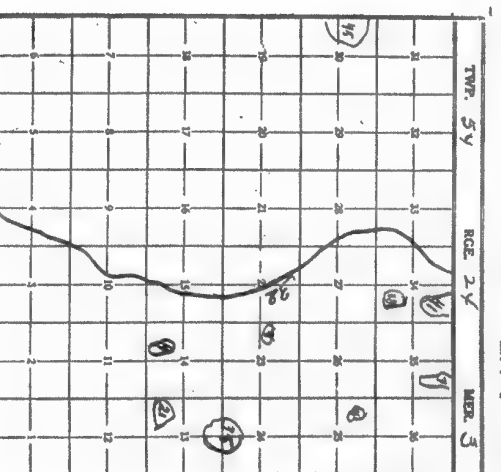
IMPORTANT
Please return this Tally Sheet with May attached to your Municipal Secretary not later than Sunday, August 11.

Name of Investigator: L. P. Dault
Occupation: Merchant
P. O. Address: Paradise Hill, Sask.
Are you a duck hunter? Yes

Page 3
Tally Sheet Number 4
Date of Observation Aug 7-8 1935 Time of Observation 5:11 PM
SASKATCHEWAN
INTERNATIONAL WILD DUCK CENSUS, 1935
Range 24
Area Reported on—Township 53

Species	Count	Remarks
Male	10	84 1 12 106
Female	7	29 7 43
Young	1	13 14
Pin	8	32 8 48
Quail	1	4 5
Quail	1	9 16

TOTAL: 28 171 1 27 247
IMPORTANT—SEE OTHER SIDE OF



1. If it was not possible to locate all ducks on the area reported on, give approximate number of ducks that should be added to the total noted on the other side of this sheet to make up the total duck population.
Old: 1 Young: 1

2. How do the number of male ducks compare approximately with the number of females?
Old: 1 Young: 1

3. What are the chief causes of losses of ducks and nests in the area covered in this report? State whether natural enemies such as crows, owls, hawks, gulls, cats, foxes, coyotes, turtles, etc.; grazing, fire, disease, drying up of water, mowing, etc.

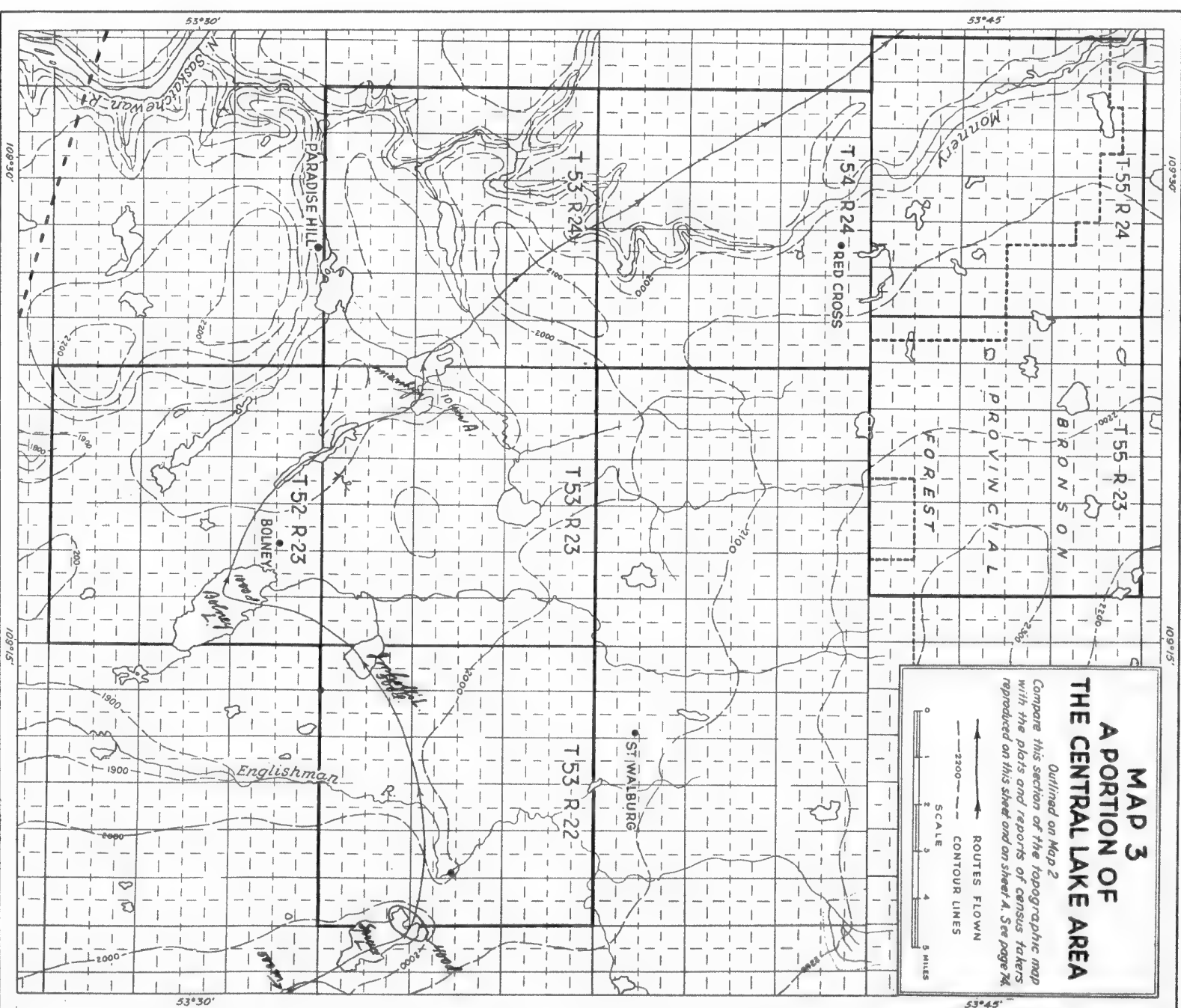
4. What is the important duck breeding place covered in your report and can be improved by building dams or dikes?
None

5. What are any places in your vicinity in which large numbers of ducks breed in former years which could be renewed?
None

6. What are your recommendations for improving duck breeding conditions in the area reported on, such as: Controlling natural enemies, cleaning up diseased places, salvaging young ducks from places which dry up or increasing natural food?
Build 100 dams.

IMPORTANT
Please return this Tally Sheet with May attached to your Municipal Secretary not later than Sunday, August 11.

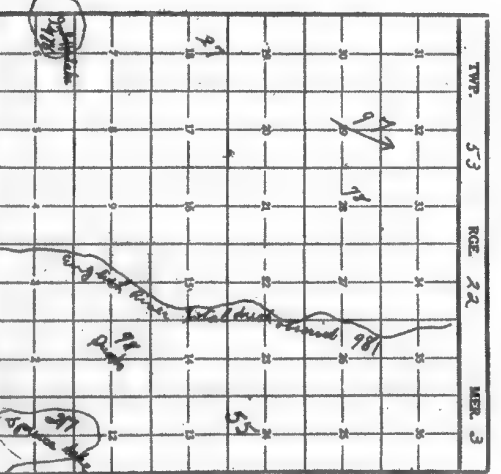
Name of Investigator: St. Ischa
Occupation: Farmer
P. O. Address: Red River, Sask.
Are you a duck hunter? Yes



Page 3
Tally Sheet Number 1
Date of Observation Aug 5 1935 Time of Observation at all hours
SASKATCHEWAN
INTERNATIONAL WILD DUCK CENSUS, 1935
Range 24
Area Reported on—Township 53

Species	Count	Remarks
Male	582	222 120 729
Female	21	185 11 197
Young	1	360 63 594
Pin	37	185 42 264
Quail	1	242 311
Quail	7	29 40
Quail	6	21 19 45

TOTAL: 360 1464 1 287 2411
IMPORTANT—SEE OTHER SIDE OF



1. If it was not possible to locate all ducks on the area reported on, give approximate number of ducks that should be added to the total noted on the other side of this sheet to make up the total duck population.
Old: 28 Young: 20

2. How do the number of male ducks compare approximately with the number of females?
Old: 28 Young: 20

3. What are the chief causes of losses of ducks and nests in the area covered in this report? State whether natural enemies such as crows, owls, hawks, gulls, cats, foxes, coyotes, turtles, etc.; grazing, fire, disease, drying up of water, mowing, etc.

4. What is the important duck breeding place covered in your report and can be improved by building dams or dikes?
None

5. What are any places in your vicinity in which large numbers of ducks breed in former years which could be renewed?
None

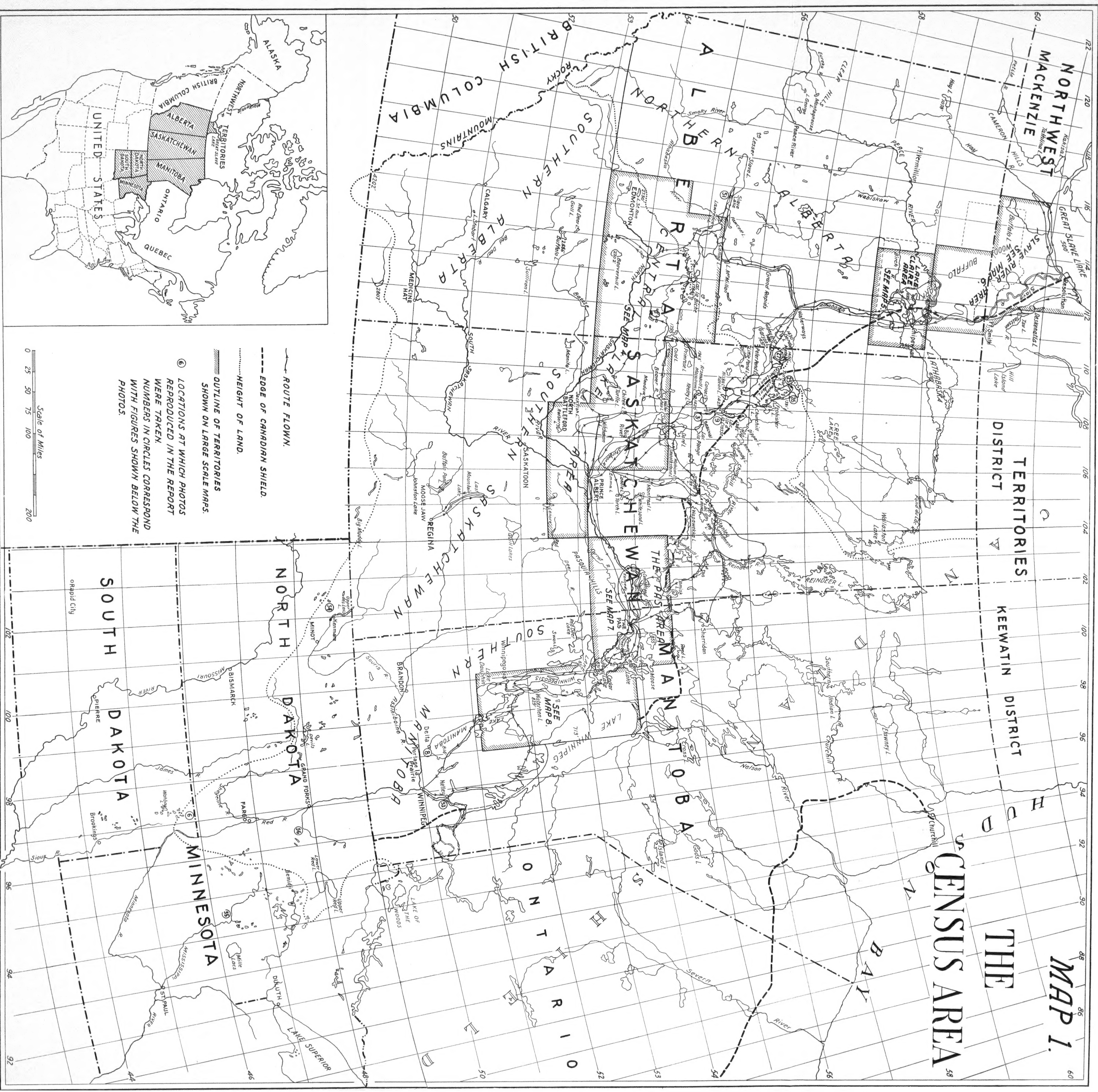
6. What are your recommendations for improving duck breeding conditions in the area reported on, such as: Controlling natural enemies, cleaning up diseased places, salvaging young ducks from places which dry up or increasing natural food?
Build 100 dams.

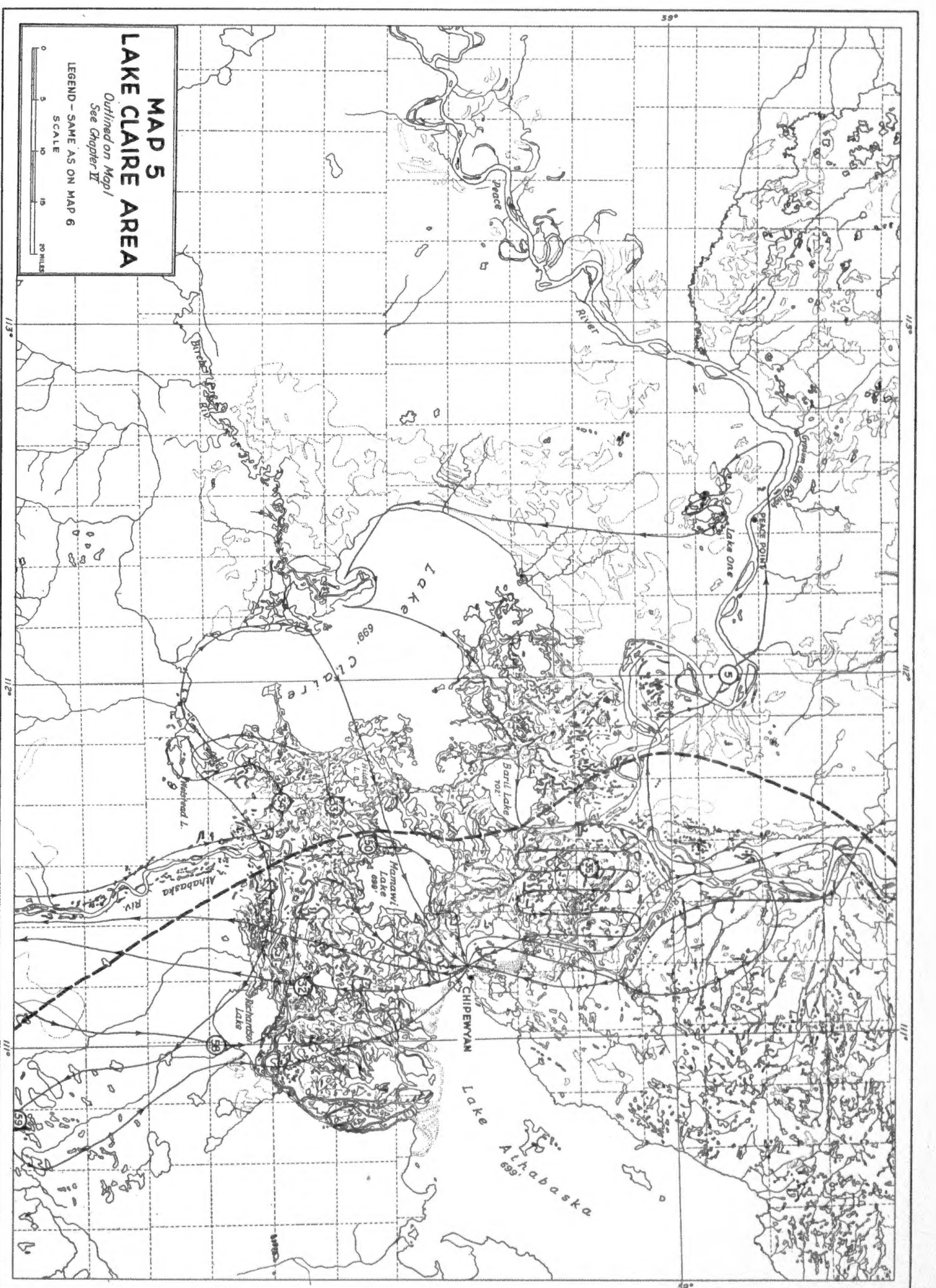
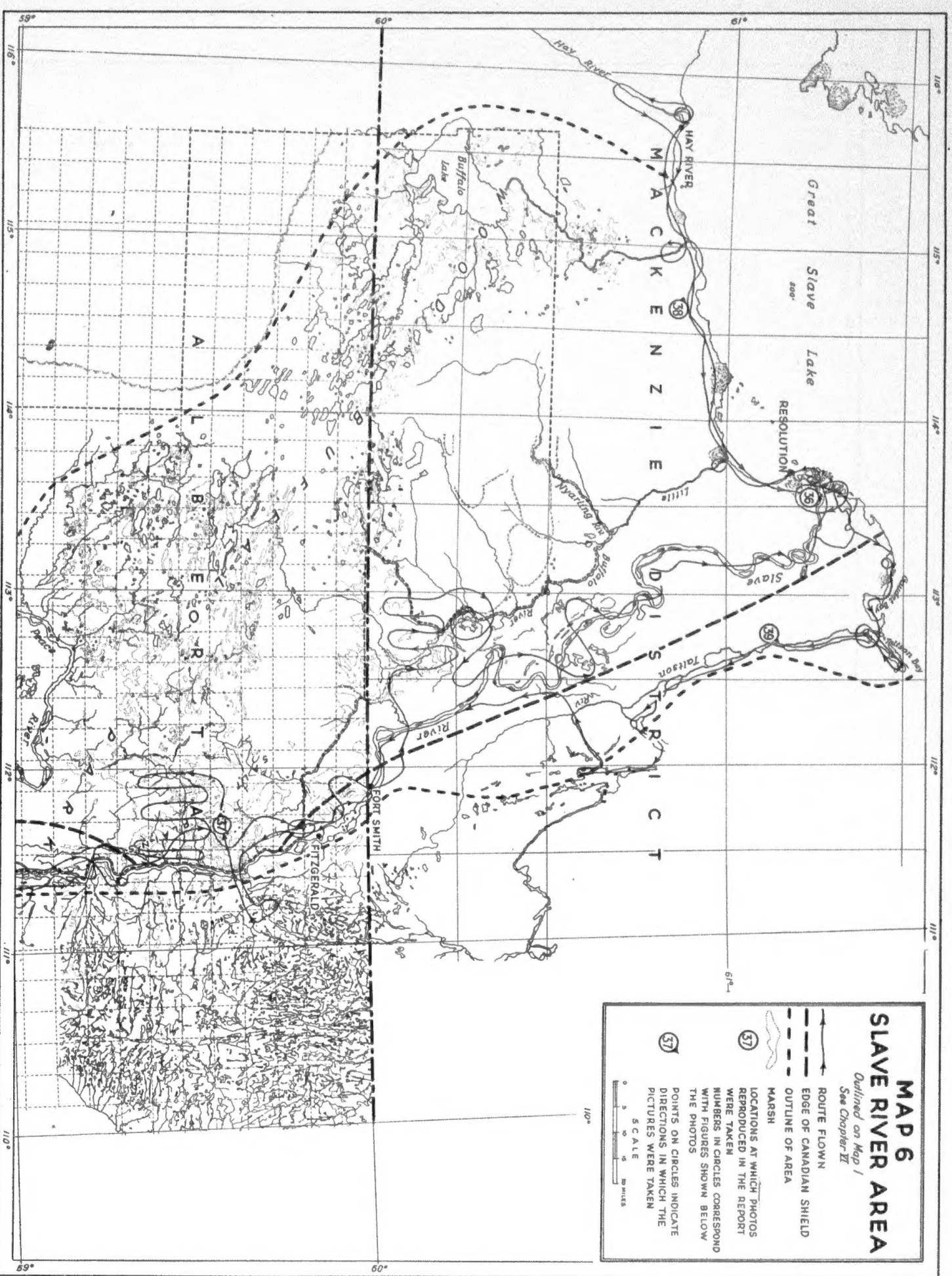
IMPORTANT
Please return this Tally Sheet with May attached to your Municipal Secretary not later than Sunday, August 11.

Name of Investigator: St. Ischa
Occupation: Farmer
P. O. Address: Red River, Sask.
Are you a duck hunter? Yes

THE 1935
INTERNATIONAL
WILD DUCK CENSUS

SHEET A





Form 3

SASKATCHEWAN

INTERNATIONAL WILD DUCK CENSUS, 1935

Title Sheet Number **1** Date of Observation **Aug 11** 1935 Time of Observation **10:30**

Area Reported on—Township **55** Range **23**

Species	Count	Remarks
Mallard	617	1
Wing	40	2
Wing	97	3
Wing	59	4
Wing	22	5
Wing	124	6
Wing	29	7
Wing	29	8
Wing	5	9
Wing	376	10

IMPORTANT—SEE OTHER SHEET

Form 4

SASKATCHEWAN

INTERNATIONAL WILD DUCK CENSUS, 1935

Title Sheet Number **1** Date of Observation **Aug 11** 1935 Time of Observation **10:30**

Area Reported on—Township **55** Range **23**

Species	Count	Remarks
Mallard	617	1
Wing	40	2
Wing	97	3
Wing	59	4
Wing	22	5
Wing	124	6
Wing	29	7
Wing	29	8
Wing	5	9
Wing	376	10

IMPORTANT—SEE OTHER SHEET

Form 1

SASKATCHEWAN

INTERNATIONAL WILD DUCK CENSUS, 1935

Municipality reported on **North 51st**

Township	Range	Section	Total No. of Ducks	Total No. of Males	Total No. of Females	Total No. of Young
53-23	23	1	340	1464	6	211
53-23	23	2	130	665	345	1040
53-24	23	3	298	803	506	8837
54-23	23	4	26	80	18	124
54-23	23	5	38	234	21	291
54-24	23	6	171	1	37	226
55-23	23	7	34	144	84	261
55-23	23	8	376	2345	444	215
55-24	23	9	850	4900	615	6365
55-24	23	10				
55-24	23	11				
55-24	23	12				
55-24	23	13				
55-24	23	14				
55-24	23	15				
Total			16030			16994

IMPORTANT

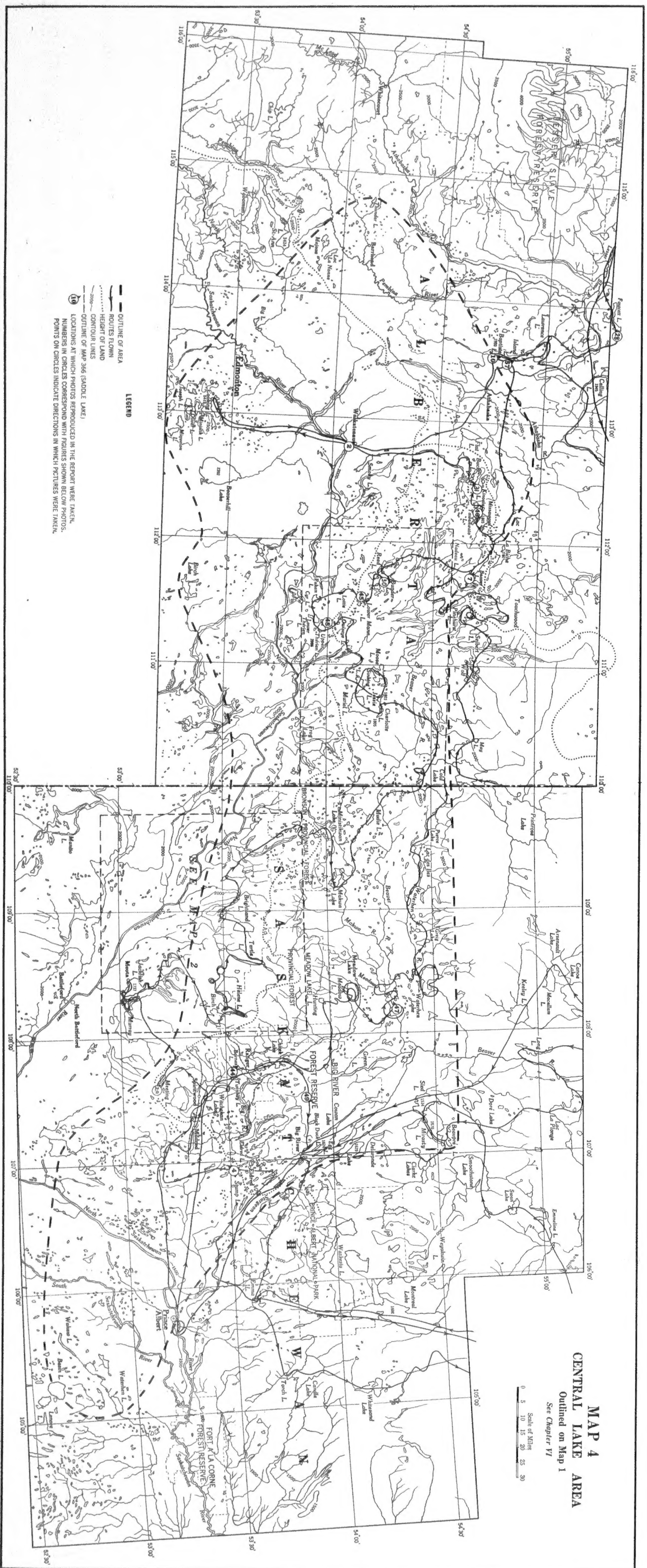
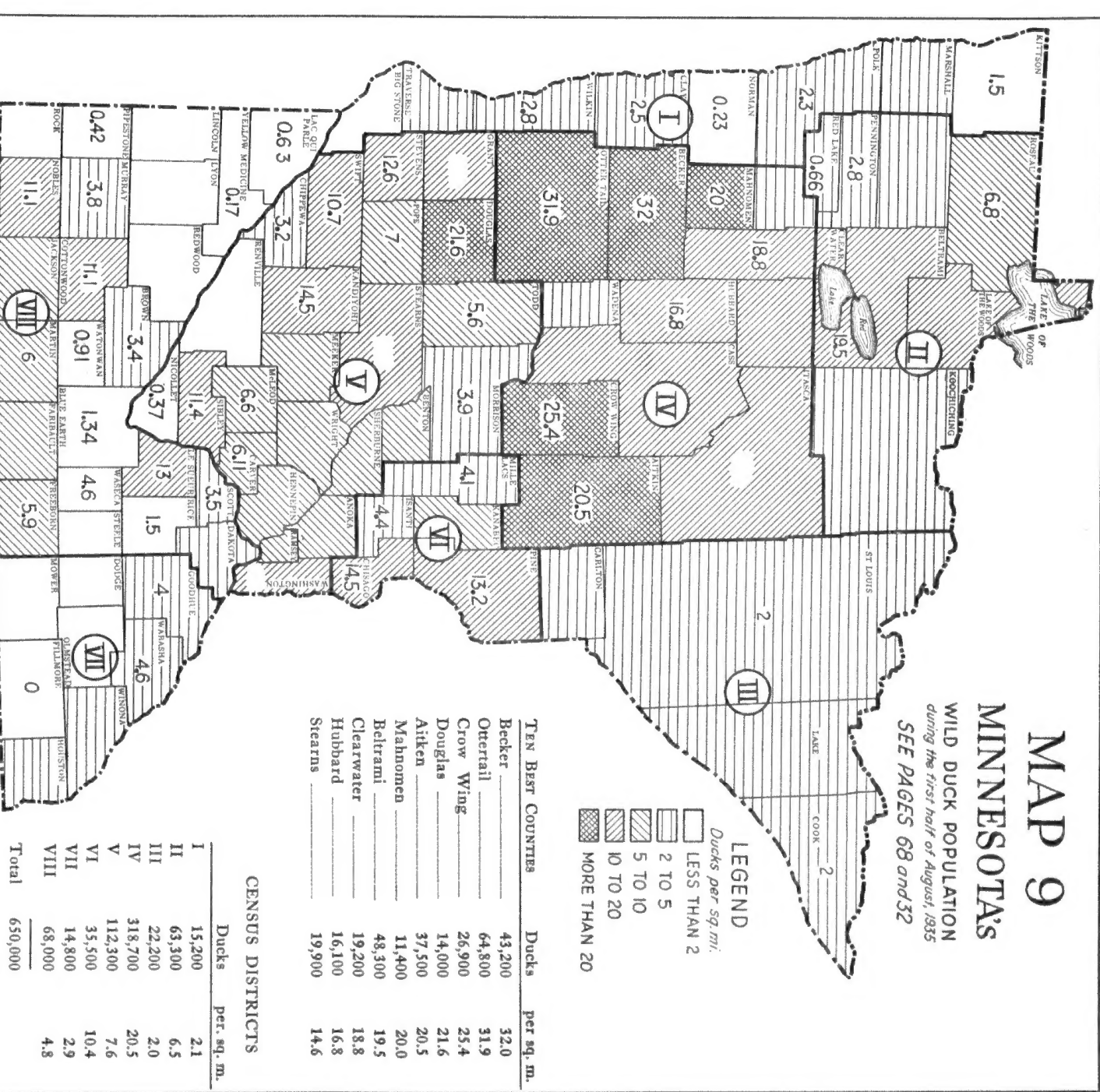
Please return this Tally Sheet to your Municipal Secretary not later than Sunday, August 11.

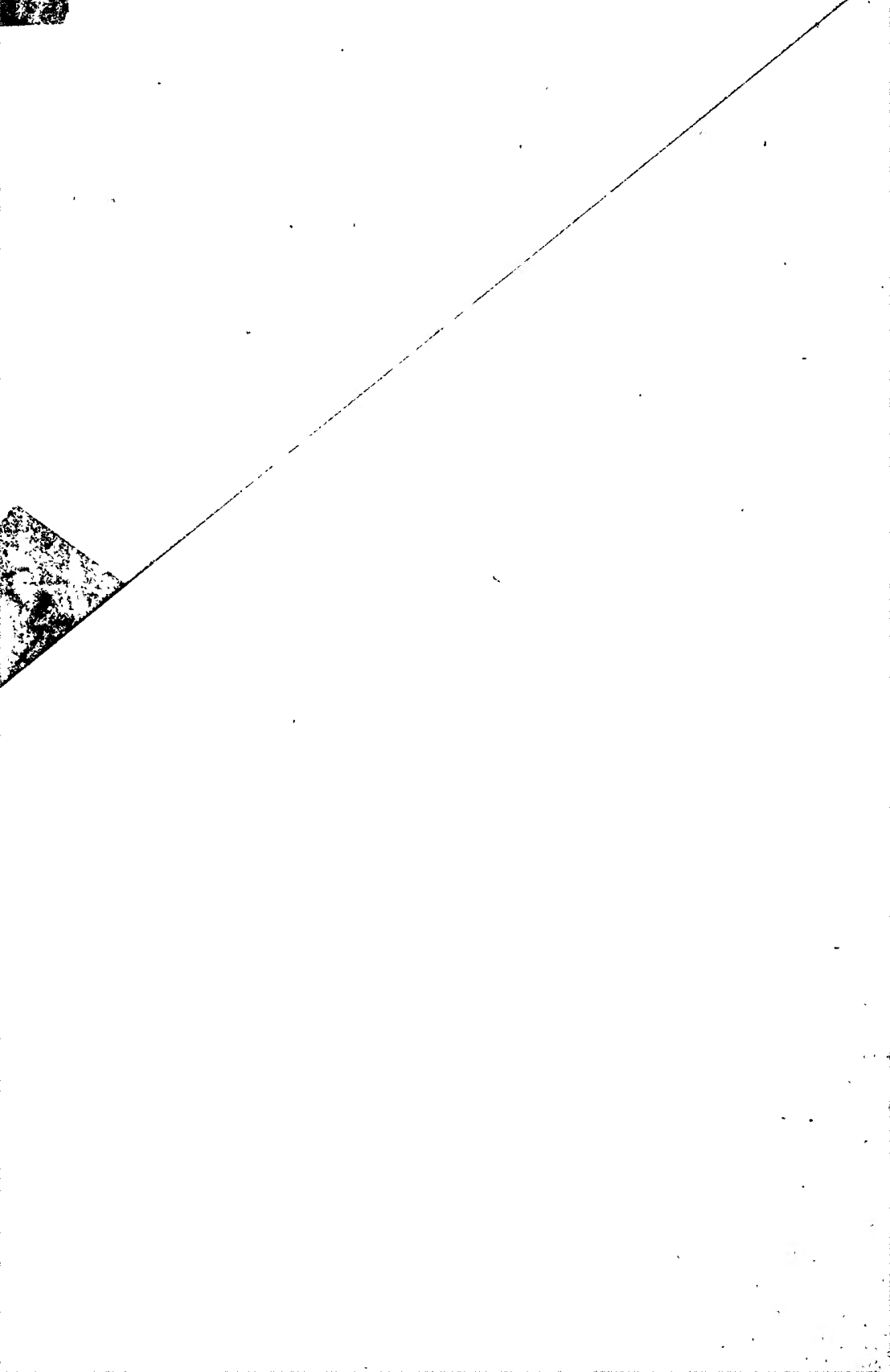
Name of Investigator **Edmund Smith**

Occupation **Surveyor**

P. O. Address **Edmund Smith**

Any other data **See other sheet**





The following booklets are available for distribution—

Waterfowl Food Plants: This booklet deals with common marsh and aquatic plants useful to waterfowl, conditions affecting the growth of such plants, and methods of caring for them.

Water Areas—How to Create and Maintain Them: A manual describing practical methods of building small dams of various types, earthen reservoirs, and of improving water supplies for waterfowl.

Small Refuges for Waterfowl: Every community should have a small local refuge for wild waterfowl. Why this should be done and how it can be accomplished by organizations and individuals are described and pictured.

More Waterfowl: A thorough presentation of a comprehensive, sound, adequate, workable, and properly financed plan for the restoration of migratory waterfowl on the North American continent.

The Duck Decline in the Northwest: An illustrated report and analysis of duck breeding conditions in the heart of the prairie duck-breeding region, the results of a field investigation.

More Game Birds by Controlling Their Natural Enemies: This illustrated booklet describes natural enemies and contains practical instructions for their control on areas devoted to the propagation of game birds.

Game Birds—How to Make Them Pay on Your Farm: This leaflet describes the many ways in which profits may be secured from game birds.

Quail Breeding Manual: A simple, fully illustrated description of the most modern methods of breeding quail in confinement.

Pheasant Breeding Manual: A simple, fully illustrated description of methods that have proved successful in rearing pheasants artificially.

Copies of these booklets may be secured free upon request from

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500 Fifth Avenue

New York City.
